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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : A61K 7/48, 7/32	A1	(11) International Publication Number: WO 97/36572 (43) International Publication Date: 9 October 1997 (09.10.97)
(21) International Application Number: PCT/US97/05310 (22) International Filing Date: 28 March 1997 (28.03.97) (30) Priority Data: 60/014,515 1 April 1996 (01.04.96) US 60/025,595 6 September 1996 (06.09.96) US 08/790,351 24 January 1997 (24.01.97) US (71) Applicant: COLGATE-PALMOLIVE COMPANY [US/US]; 300 Park Avenue, New York, NY 10022 (US). (72) Inventors: MENDOLIA, Michael, S.; 1103 Sunny Slope Road, Bridgewater, NJ 08807 (US). VINCENTI, Paul; 95 Minnisink Road, Jefferson, NJ 07849 (US). BARR, Morton, L.; 22 Hamilton Drive, East Brunswick, NJ 08816 (US). ESPOSITO, Anthony; 414 East 3rd Avenue, Roselle, NJ 07203 (US). BLUM, Yigal; 1192 Lynbrook Way, San Jose, CA 95129 (US). SCHMIDT, Hans-Werner; Lisztstrasse 26, D-95444 Bayreuth (DE). CHEN, Huiyong, Paul; 882 San Aleso Avenue, Sunnyvale, CA 94806 (US). RIESS, Gisbert; Oderweg 14, D-95213 Munchberg (DE). WU, Hui-Jung; 38770 Buckboard Common, Fremont, CA 94536 (US). (74) Agent: MIANO, Rosemary; Colgate-Palmolive Company, 909 River Road, Piscataway, NJ 08855-1343 (US).	(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>	
(54) Title: COMPOSITION WITH THICKENING AGENTS HAVING HYDROGEN-BONDING GROUPS (57) Abstract <p>An invention is disclosed which comprises gelling agents which (1) contain both siloxane groups and hydrogen-bonding groups to thicken compositions containing silicone fluids (volatile and/or non-volatile silicone fluids); (2) are non-flowable solids at room temperature; and (3) dissolve in a fluid which contains silicone at a temperature of 25-250 °C to form a translucent or clear solution at a temperature in this range. Cosmetic compositions may be made by adding at least one active ingredient such as an antiperspirant.</p>		

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COMPOSITION WITH THICKENING AGENTS
HAVING HYDROGEN-BONDING GROUPS

BACKGROUND OF THE INVENTION

5 The present invention is directed to a cosmetic composition (for example, a solid cosmetic composition, such as a gel, soft-solid or semi-solid (cream), or stick), comprised of a base composition containing at least one
10 silicone fluid (for example, silicone liquids such as silicone oils) which is thickened using a gelling agent, which base composition can include increased amounts of the silicone fluids; a carrier in which cosmetically active materials are incorporated; and at least one active ingredient to provide the activity for such cosmetic composition. Particular
15 embodiments of the present invention include deodorant and antiperspirant compositions (and base compositions therefor), in which the cosmetically active ingredient is a deodorant active material and/or an antiperspirant active material, which can include increased amounts of silicone fluids. The
20 present invention is not limited, however to such antiperspirant and/or deodorant compositions, and is also directed to other cosmetic compositions containing other cosmetically active ingredients, such as sun protection compositions containing sun-screen agents as the active
25 material. In particular, the present invention is directed to

5 cosmetic compositions which are preferably transparent
(clear), including solid transparent (clear) compositions,
especially transparent (clear) deodorant and/or antiperspirant
compositions, which can include increased amounts of silicone
fluids. While the present compositions are preferably clear
10 or transparent, the compositions need not, however, be clear
or transparent, and can be translucent, or can be opaque.

The compounds used as gelling agents in this invention
include selected siloxane polymers with hydrogen bonding
groups, such as hydrogen bonding groups selected from the
15 group comprising ester groups, urethane groups, urea groups,
thiourea groups, amide groups and groups which have more than
one of the aforementioned groups such as urea-urethane
compounds.

Particular forms of the invention include clear or
20 transparent antiperspirant compositions in stick or gel form.
More particularly, such embodiments are directed to a clear
gel or stick composition including a polyurea, polyurethane or
polyamide gelling agent, and having an active ingredient (for
example, an antiperspirant active material) incorporated
25 therein, the composition having improved application and
cosmetic properties (including reduced tackiness and
stickiness).

Antiperspirant products are well known in the art..
Antiperspirant products have appeared in the marketplace in
30 various dosage forms, such as sticks, gels, roll-ons, aerosols

5 and creams. Generally, these dosage forms include a solution
of the active ingredient in a solvent, a suspension of the
active ingredient in a non-solvent, or a multi phase
dispersion or emulsion in which a solution of the active
ingredient is dispersed in some continuous phase or in which
10 the solubilized active ingredient constitutes a continuous
phase.

Of the above-referred-to dosage forms, the roll-on is an
example of a liquid form composition, the stick form is an
example of a solid form composition, and the gel form is a
15 thickened form which may or may not be a solid (for example,
under some circumstances gels can flow). The stick form can
be distinguished from a gel in that, in a stick, the
formulated product can maintain its shape for extended time
periods outside the package, the product not losing its shape
20 significantly (allowing for some shrinkage due to solvent
evaporation), while a gel cannot so maintain its shape.
Adjustment of amounts of gelling or thickening agents such as
bentones, fumed silica or polyethylene, or stearyl alcohol and
castor wax, can be used in order to form a gel or stick.

25 Gels, pastes and creams (which are also known as soft-
solids or semi-solids) can be suitably packaged in containers
which have the appearance of a stick, but which dispense
through apertures (for example, slots or pores) on the top
surface of the package. These products have been called soft
30 sticks or "smooth-ons". These products hereinafter are

5 generically called "gels". Reference is made to U.S. Patent
No. 5,102,656 to Kasat, No. 5,069,897 to Orr, and No.
4,937,069 to Shin, each of which discloses such gels,
including physical characteristics thereof such as viscosity
and hardness. The contents of each of these three U.S.
10 Patents are incorporated herein by reference in their
entirety.

A representative composition which can be dispensed
through apertures is described in U.S. Patent No. 5,102,656
to Kasat. This disclosed composition is a creamy,
15 heterogeneous anhydrous antiperspirant product containing, in
percent by weight, of the total weight of the composition, 30%
- 70% of a volatile silicone as a carrier, 7 - 30% of a
suitable gelling agent or agents, and about 12 - 30% of a
physiologically acceptable antiperspirant agent. This patent
20 discloses that the gelling agent can be any of a number of
materials, including, for example, hydrogenated vegetable oil,
hydrogenated castor oil, fatty acids having from 14 to 36
carbon atoms, beeswax, paraffin wax, fatty alcohols having
from 14 to 24 carbon atoms, polyethylene and the like.

25 Recently, there has been significant activity in
developing clear or translucent antiperspirant sticks and
gels. Clear or translucent sticks consisting essentially of a
solution of the active antiperspirant material in a polyhydric
alcohol vehicle, gelled by dibenzylidene monosorbitol acetal,
30 have been disclosed. Since the gelling agent is inherently

5 unstable in an acidic environment, and since conventional
active antiperspirant materials are acidic, much work has been
involved in discovering suitable stabilizing or buffering
agents to prevent or slow down acid attack on the acetal
gelling agent. Such work has not been completely successful.
10 Moreover, these clear or translucent antiperspirant sticks
containing the acetal gelling agent and including a
solubilized active antiperspirant material, have the
disadvantage of being inherently tacky. Thus, development
work in connection with these clear or translucent
15 antiperspirant sticks containing the acetal gelling agent has
also focused on discovering suitable anti-tack agents for this
dosage form. However, since acid hydrolysis of the gelling
agent occurs more rapidly in aqueous solutions, formulators
have been forced to avoid using water in the formulations.
20 This severely restricts the ability of the formulator to
develop cosmetically elegant formulations which are
simultaneously chemically stable, optically clear, low in
tack, low in residue and which have acceptable application
aesthetics.
25 Clear or translucent antiperspirant gels (which have been
dispensed from containers having the appearance of a stick)
have been marketed, consisting of viscous, high internal phase
emulsions. These gels exhibit some advantages over the
aforementioned acetal-based clear sticks, in that the
30 selection of formulation ingredients is less restricted (for

5 example, water can be used), and often tack can be reduced significantly. But these emulsions suffer from various disadvantages, including often requiring the use of ethanol to achieve desired aesthetics. In addition, these emulsions are relatively expensive. In connection with these emulsions, see
10 U.S. Patent No. 4,673,570 to Soldati and PCT (International Application) Publication No. WO 92/05767, the contents of each of which are incorporated herein by reference in their entireties.

U.S. Patent No. 5,403,580 to Bujanowski, et al discloses
15 an antiperspirant product which is an organosilicon gel, containing as components at least one material selected from the group consisting of astringent antiperspirant compounds, a volatile silicone, a suspending agent, a waxy material, emollients, perfumes, coloring agents and other ingredients
20 normally used in making antiperspirant products. This composition utilizes as a gelling agent an organic compound which includes polycyclic aromatic and steroidal groups linked through ester linkages. These gels are thermally irreversible. The gelling agent is predissolved in an organic
25 solvent, among which are halogenated organic compounds such as chloroform, and gelation occurs by crystallization of the gelling agent from the silicone-solvent mixture. The contents of U.S. Patent No. 5,403,580 are incorporated herein by reference in their entirety.

30 European Patent Application No. 636,361 to Mougin, et al

5 discloses a cosmetic composition containing, in a cosmetic carrier, at least one pseudo-latex based on a multi-sequenced polycondensate having a chain formed by (a) at least one polysiloxane sequence, and (b) at least one polyurethane and/or polyurea sequence containing anionic or cationic
10 components. This reference discloses cosmetic compositions which are specifically useful as hair-treatment compositions and make-up compositions.

U.S. Patent No. 5,120,531 to Wells, et al discloses
rinse-off hair conditioner compositions providing both hair
15 conditioning and hair styling benefits. The described compositions include specific amounts of a hair conditioning agent, a hair styling polymer formed from specific monomers, a non-aqueous solvent solubilizing the polymer, and an aqueous carrier. This patent discloses that the conditioning agent
20 can provide not only hair conditioning benefits but also provide a gel-network thickened vehicle for the styling polymer and solvent. This patent discloses various siloxanes as the conditioning agent including polydiorganosiloxanes having quaternary ammonium-substituted groups attached to the
25 silicon, and polydiorganosiloxanes having silicone-bonded substituents which are amino-substituted hydrocarbon groups.

U.S. Patent Application 5,500,209 (issued on Serial No. 08/214,111), the contents of which are incorporated herein by
reference in their entirety, discloses a gel or stick which
30 includes active deodorant and/or antiperspirant ingredients, a

5 polyamide gelling agent, and a solvent for the polyamide
gelling agent, which gel or stick composition can be clear or
translucent. This patent application discloses that the
polyamide gelling agent is soluble in a cosmetically
acceptable solvent at elevated temperatures, and solidifies
10 (gels) upon cooling; acceptable solvents are disclosed as
including various alcohols, including various glycols. While
the polyamide-containing stick or gel disclosed in the
aforementioned U.S. Patent contains desirable properties in
connection with stability of the composition, particularly in
15 the presence of acidic antiperspirant active materials, and in
providing clear or translucent gel or stick compositions,
various attributes need to be improved. Specifically, the
compositions according to U.S. Patent 5,500,209 containing
glycol solvents for the polyamide gelling agent and/or for the
20 antiperspirant active material, may have a disadvantageously
large amount of tackiness and stickiness both upon and after
application to the skin.

Addressing this problem of tackiness and stickiness in
connection with cosmetic compositions utilizing a polyamide
25 gelling agent, U.S. Patent Application Serial No. 08/426,672,
filed April 21, 1995, the contents of which are incorporated
by reference herein in their entirety, discloses use of a
specific solvent system for a solid composition containing an
antiperspirant active material and a polyamide gelling agent.
30 This solvent system is glycol-free and contains a non-ionic

5 surfactant and a polar solvent. Water is the polar solvent,
and with the non-ionic surfactant acts as a dispersing medium
for the antiperspirant active material, in which sufficient
water is used to give a clear or translucent solution/emulsion
of the antiperspirant active material.

10 A typical technique to reduce the tackiness of, for
example, antiperspirant formulations is the incorporation of
cyclomethicone (a mixture of penta- and hexacyclodimethyl-
siloxanes). This cyclomethicone is a very low-viscosity
liquid that provides excellent lubricity, which eliminates the
15 tacky feeling. Cyclomethicone is also mildly volatile and
therefore does not leave stains on the skin and/or clothing.
More than 50% by weight of cyclomethicone has been
incorporated into solid stick antiperspirant formulations, for
example, using a wax solidifying agent. However,
20 cyclomethicone is a nonsolvent for the dimer based polyamides
described as gelling agents in U.S. Patent 5,500,209.
Moreover, only limited quantities of the cyclomethicone (for
example, 37% by weight) can be incorporated in solid
compositions gelled using such polyamide gelling agent,
25 without destroying the clarity of the gelled composition.
Beyond that point, the gelled composition becomes cloudy
because of either excessive crystallization of the polyamide
or immiscibility of the cyclomethicone in the mixture.

U.S. Patent No. 5,243,010 to Choi, et al., the contents
30 of which are incorporated herein by reference in their

5 entirety, discloses aromatic polyamide resins having pendant
silyl groups, such resin having excellent heat-resistance,
mechanical strength, electrical conductivity and other
physical properties, as well as excellent solubility in common
organic solvents and improved molten processing properties.
10 This patent does not describe use of the aromatic polyamide
resin as a gelling agent, much less as a gelling agent in
cosmetic compositions to provide solid cosmetic compositions.

U.S. Patent No. 5,272,241 to Lucarelli, et al., the
contents of which are incorporated herein by reference in
15 their entirety, discloses organofunctional siloxanes useful in
both the personal care and plastics industries, the siloxanes
being amino acid functionalized silicones. It is disclosed in
this patent that the siloxanes have uses as plastic additives,
hydraulic fluids, vibration damping agents, release agents,
20 antifoamers, dielectric media, water repellents, surfactants,
cosmetic and health product additives, lubricants, etc. This
patent does not disclose use of the siloxanes as gelling
agents.

Notwithstanding the foregoing, there is still a need for
25 base compositions, thickened with a gelling agent, which base
compositions can include increased amounts of silicone fluids
(for example, silicone liquids, both volatile and non-
volatile), and which base compositions are useful in forming
cosmetic compositions. Such increased levels of silicone
30 fluids are desired because these silicone fluids impart good

5 cosmetic characteristics to the composition. Specifically,
these fluids are desirable because of their skin feel,
volatility and low toxicity. Moreover, it is also desired to
provide such base compositions, thickened utilizing such
gelling agent, which are transparent and clear, and can be
10 formed into products having varying degrees of firmness, such
as from a cream to a stick, depending on amounts of thickening
agent contained in the composition. More particularly, it is
desired to provide a clear antiperspirant and/or deodorant
composition having good efficacy, attractive appearance and
15 which leaves no visible (white) residue upon application and
after drying.

Thus, it is an object of the present invention to provide
a base composition, in which a cosmetically active material
can be incorporated to form a cosmetic composition for
20 example, an antiperspirant and/or deodorant, wherein the base
composition is thickened using a gelling agent and wherein the
base composition can have increased (high) levels of silicone
fluid (for example, volatile and non-volatile silicone
liquids). Objects of the present invention also include
25 providing a cosmetic composition including this base
composition and cosmetically active materials and methods of
using this cosmetic composition.

It is a further object of the present invention to
provide such base compositions which do not need particulates
30 and/or conventional gelling agents (such as stearyl alcohol

5 and hydrogenated castor oil) as thickening agents, and which can have increased levels of silicone fluids.

It is a further object of the present invention to provide such base compositions and cosmetic compositions made therewith, which can have increased amounts of silicone
10 fluids, and which are also clear (transparent).

It is another object of the present invention to provide such base composition and such cosmetic composition, which can have high levels of silicone fluid, and which can be provided in thickened form as a cream (as a semi-solid or soft solid),
15 as a gel or as a stick, depending upon the amount of the thickening agent incorporated in the composition.

It is yet another object of the present invention to provide an antiperspirant or deodorant composition, which is highly efficacious and leaves no visible (white) residue,
20 which is thickened using a gelling agent, and which can contain increased (high) amounts of silicone fluid.

It is a further object of the present invention to provide a clear antiperspirant or deodorant cosmetic composition which has an attractive appearance and which is
25 highly efficacious, which comprises a base composition thickened by incorporating therein a gelling agent, and which can contain large amounts of silicone fluids, and to provide a method of using such composition.

It is an overall object of the present invention to
30 provide siloxane polymers which can be used as gelling agents

5 to thicken cosmetic compositions, which polymers are compatible with large amounts of silicone fluids and can gel the silicone fluids (for example, volatile or non-volatile silicone liquids).

10 It is an object of particular embodiments of the invention to provide a vehicle for a thickened (for example, solid) cosmetic composition in which a cosmetic active ingredient can be incorporated, utilizing, for example, a polyurethane, polyurea or polyamide gelling agent, which vehicle and resulting cosmetic composition have improved
15 application properties (including reduced tack), and a method of forming the same. It is also an object of this particular embodiment of the invention to provide a gelling agent or co-gelling agent for such vehicle and cosmetic composition.

20 It is a further object of particular embodiments of the present invention to provide a solid cosmetic composition (for example, a gel or stick composition), containing a cosmetically active ingredient and polyurethane, polyurea and/or polyamide gelling agents, which can be a clear composition, having reduced tack both upon and after
25 application, and a method of forming the same.

It is a still further object of various embodiments of the present invention to provide a solid cosmetic composition, utilizing a polyurethane, polyurea and/or polyamide gelling agent, and which has increased compatibility with silicone
30 fluids (for example, cyclomethicone or dimethicone liquids),

5 allowing creation of compositions which contain high levels of
silicone fluids (such as these silicone oils), and a method of
forming the same.

It is another object of particular embodiments of the
present invention to provide solid cosmetic compositions
10 utilizing polyurethane, polyurea and polyamide gelling agents,
which compositions have improved cosmetic and application
properties, including having reduced tackiness and stickiness,
and a method of producing the same.

It is a still further object of particular embodiments of
15 the present invention to provide an antiperspirant and/or
deodorant solid (for example, gel or stick) composition,
containing deodorant and/or antiperspirant active materials,
thickened using a polyurethane, polyurea or polyamide gelling
agent, which cosmetic composition can be clear or at least
20 translucent, the cosmetic composition containing increased
amounts of silicone fluids (for example, cyclomethicone and/or
dimethicone) and having reduced tackiness and stickiness both
upon and after application, and a method of making the same.

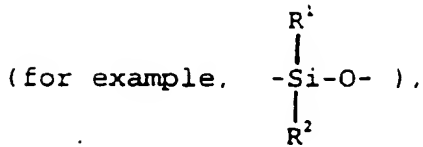
25 SUMMARY OF THE INVENTION

The foregoing objects are achieved by the present
invention which comprises using as gelling agents polymers
which (1) contain both siloxane groups and hydrogen-bonding
groups to thicken compositions containing silicone fluids
30 (volatile and/or non-volatile silicone fluids); (2) are non-

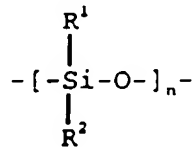
5 flowable solids at room temperature; and (3) dissolve in a fluid which contains silicone at a temperature of 25 - 250 degrees C to form a translucent or clear solution at a temperature in this range. The base composition formed from the polymers and the silicone fluids (optionally with the
10 addition of other solvents) is then combined with at least one active ingredient (which itself may need a further vehicle to be incorporated into the base composition) and other optional ingredients such as fragrance, emollients (especially silicone-miscible emollients), coloring agents, fillers,
15 antibacterials (antimicrobials) and other conventional ingredients known to those in the art for formulating such products to form cosmetic compositions.

The base compositions according to the present invention include (1) at least one silicone fluid and, (2) as a
20 thickening agent, a gelling agent which is a polymer that is soluble in the silicone fluid and that can form a gel from a solution in the silicone fluid, wherein this siloxane polymer has (a) siloxane groups, and (b) hydrogen-bonding groups such that the gel can be formed. By soluble in the silicone fluid,
25 we mean that the polymer can be dissolved in the silicone fluid at least at elevated temperatures (but below the boiling point of the silicone fluid).

5 By siloxane groups we mean groups having siloxane units:



where R^1 and R^2 are each independently selected from the group
 10 consisting of methyl, ethyl, propyl, isopropyl and phenyl
 wherein the phenyl is optionally substituted independently by
 1, 2 or 3 of methyl and ethyl) in the polymer. The siloxane
 units can be in the main chain, in pendant chains or in both
 the main chain and in pendant chains. The siloxane units occur
 15 in segments



20

in the polymer where each segment of repeating siloxane units
 has a number "n" (average number of siloxane units)
 independently selected from the range of 1-1000, more
 particularly in the range of 1-300, and even more particularly
 25 in the range of 10-100.

The polymers described as thickening agents (also called
 gelling agents herein) also contain hydrogen-bonding groups
 (that is, polar groups) selected from the group consisting of
 ester groups, urethane groups, urea groups, thiourea groups,
 30 amide groups, and a combination of such groups in the same

5 polymer. Examples of polymers which contain more than one of such groups are urea-urethane compounds. Mixtures of polymers containing only one type of hydrogen bonding group each are also included in the scope of the invention.

It should be noted that ester groups are capable of
10 hydrogen-bonding only in conjunction with X-H groups (for example, X being nitrogen or oxygen) such as amide, urethane, urea and thiourea groups. Polyester polymers only by themselves may not function as gellants, but polyester copolymers containing other groups, such as urea groups, could
15 act as thickening agents of compositions according to the present invention. Thus, hydrogen bonding is most important in substances in which a hydrogen atom is bonded to nitrogen or oxygen. The N-H and O-H bond dipoles are capable of interacting with an unshared electron pair on the nitrogen or
20 oxygen atom of an adjacent molecule. It is this electrostatic attraction between the X-H bond dipole of one molecule and the unshared electron pair of another molecule that constitutes hydrogen bonding. It is possible to have hydrogen bonding arrangements of the kind of X-H... Y for cases where X and Y are, for example, N or O (the dotted line segment between "H" and "Y" refers to the hydrogen bond between the X-H dipole and the unshared electron pair of Y). The hydrogen-bonding groups can be provided at various locations of the polymer. That is, the hydrogen-bonding groups can be provided within the main
25 chain, on side chains off the main chain, at the terminal ends
30

5 of the main chain, or at locations such that the polymer is tetraterminated with hydrogen-bonding groups.

The number and location of the siloxane units and the hydrogen bonding units are selected so that the polymers are non-flowable solids at room temperature (for example from 16
10 degrees - 30 degrees C and more particularly from 18 -25 degrees C); and dissolve in a fluid which contains silicone at a temperature of 25 - 250 degrees C to form a translucent or clear solution at a temperature in this range.

The silicone fluids to be incorporated in compositions
15 according to the present invention are those conventionally utilized in cosmetic compositions. These include linear siloxanes known as dimethicones, linear siloxanes containing an aromatic substitution such as phenyl trimethicone and the various cyclic siloxanes having from 4-6 members in a ring
20 optionally substituted by C1-C6 alkyl or phenyl, particularly cyclic dimethyl siloxanes such as cyclomethicones. Mixtures of such silicone fluids may also be used. Suitable volatile silicone liquids are described in U.S. Patent No. 5,102,656 to Kasat, referenced above. Examples of other known silicone
25 fluids for use in cosmetic compositions are disclosed in U.S. Patent No. 4,853,214 to Orr, referenced above and are suitable for use in this invention. Other particular examples include linear volatile silicone fluids, for example, silicone liquids conventionally used in cosmetic compositions.

30 The cosmetic compositions according to the present

5 invention include the at least one silicone fluid and the
siloxane-containing polymer as well as at least one
cosmetically active material, incorporated in the composition
in an amount sufficient to have a functional effect. Such
actives include, but are not limited to fragrances,
10 sunscreens, antiperspirants, deodorants and antibacterials.
For example, where the composition is a composition to protect
skin from the sun, a sufficient amount of a sun-screening
agent is provided in the composition such that when the
composition is applied to the skin, the skin is protected from
15 the harmful effects of the sun (for example, is protected from
ultraviolet rays from the sun).

Clear (transparent) base compositions, and clear (trans-
parent) cosmetic compositions, that are thickened (more
viscous) as compared to the viscosity of the silicone fluids,
20 can be achieved using these siloxane-containing polymers as
thickening agents.

The compositions of the present invention can also be
utilized to form clear antiperspirant compositions having
multiphase systems, such multiphase systems having a polar
25 (for example, water) phase (including an antiperspirant active
material) and an oil phase (including the silicone fluids and
siloxane polymer). In order to provide a clear multiphase
system, refractive indices of the oil and polar phases
desirably should be matched, as done conventionally in the
30 art.

5 As noted above, the polymers used as thickening agents in
base and cosmetic compositions of the present invention
contain both siloxane units and hydrogen-bonding groups. The
siloxane units provide compatibility with the silicone fluid
(for example, with the cyclomethicones), while the hydrogen-
10 bonding groups facilitate gelation by achieving hydrogen
bonding, for example, upon cooling a solution of the siloxane
polymer in the silicone fluid.

 The polymers containing siloxane units and hydrogen
bonding groups incorporated as thickening agents in base and
15 cosmetic compositions according to the present invention can
be copolymers in which: (1) a siloxane diamine (that is, a
molecule that contains at least one siloxane unit and which
contains two amino groups) is reacted with a diacid (or diacid
derivative), diisocyanate and/or a diisothiocyanate, to
20 produce amide groups, urea groups or thiourea groups,
respectively, as the hydrogen-bonding groups; (2) a siloxane
diacid (or siloxane diacid derivative) is reacted with a diol
or diamine, to produce ester groups or amide groups,
respectively; or (3) a siloxane diol is reacted with a
25 diisocyanate, to produce urethane groups as the hydrogen-
bonding groups. As noted above, the polymers used in this
invention can also be formed to contain a combination of the
hydrogen-bonding groups, by appropriately reacting the
relevant monomers such as, for example, a siloxane diamine,
30 diacid or diol with a combination of diisocyanates and

5 diacids, diisocyanates and diols.

 According to one aspect of the invention which provides
polyurethane compounds, a siloxane diol may be reacted with a
diisocyanate to form the polyurethane. Suitable diols include
those where $n = 1-100$ repeating units, optionally substituted
10 on at least one of the silicones by copolymer units having at
least one of methyl, ethyl, propyl, isopropyl or aryl (for
example, phenyl) groups. Suitable diisocyanates include:

 (a) C1-C15 linear and branched aliphatic groups optionally
substituted by at least one member of the group consisting of
15 C1-C15 alkyl and C5-C10 aryl; (b) C5-C10 cyclic aliphatic and
aromatic groups optionally substituted by at least one member
of the group consisting of C1-C15 alkyl and C5-C10 aryl.

 Examples of particular diisocyanates include hexamethylene
diisocyanate, toluene diisocyanate and isophorone
20 diisocyanate. Comb-branched variations containing hydroxyl
groups may also be used as reagents and reacted with
monoisocyanate such as phenyl isocyanate.

 According to another aspect of the invention which
provides polyurea compounds, a siloxane diamine may be reacted
25 with a diisocyanate (for example, hexamethylene diisocyanate,
toluene diisocyanate or isophorone diisocyanate) to form the
polyurethane. Comb-branched variations containing amine groups
may also be used as reagents and reacted with monoisocyanate
such as phenyl isocyanate.

30 According to yet another aspect of the present invention

5 which provides polyamide compounds, the polymer is a copolymer
formed from monomers or oligomers including a siloxane
oligomer such as a copolymer formed by reacting an
oligosiloxane diamine with a dimer acid. Polyamide gelling
agents useful in this invention can also be formed by: (1)
10 silyl amidation or silyl esterification of dimer-based
polyamides (for example, reacting free acid end-sites on an
original polyamide with oligosiloxanes each containing at
least one amine group, or with oligosiloxane alcohols or
diols); (2) substituting an oligosiloxane diamine for the
15 diamine in an original polyamide (transamidation at elevated
temperatures, such as at least 150 degrees C and more
particularly, at least 200 degrees C); (3) grafting pendant
oligosiloxane groups on an original polyamide; or formed by
conventional techniques, some of which are discussed below.

20 The compounds of the present invention exhibit desirable
properties from the standpoint of their compatibility with
siloxane units compounds such as cyclomethicone. This is in
distinction to our recently issued U.S. Patent 5,500,209
reciting the use of polyamides as gelling agents. For example,
25 in the case of an amide thickening agent of the invention,
such an amide thickening agent enhances compatibility of a
silicone fluid, such as cyclomethicone and/or dimethicone, in
the composition, so that increased amounts of the silicone
fluid can be included in the composition without adversely
30 affecting other properties (for example, clarity) of the

5 composition. For example, the composition can include more
than 50% by weight of a silicone oil. Moreover, by
incorporating increased amounts of the silicone fluid in the
composition, tackiness and stickiness of the composition can
be reduced. In addition, various of the amide thickening
10 agents (as well as the other agents described herein such as
polyurethane and polyurea agents) having silicon-containing
moieties per se, described below, provide a gel which is less
tacky or sticky than, for example, various of the polyamide
thickening agents described in the aforementioned U.S. Patent
15 5,500,209, even without the increased amounts of silicone oil.

Cosmetic compositions according to the present invention
can also include surface active agents and/or solvents for the
cosmetically active material. For example, where the
composition is an antiperspirant composition, containing
20 antiperspirant active material, the antiperspirant active
material can be included in the composition in a solution in,
for example, water, ethanol and/or propylene glycol, which is
not miscible with the silicone fluid, and the composition can
also include surface active agents so as to disperse the
25 solution of antiperspirant active material in the composition.
Where the composition according to the present invention is a
deodorant composition, the composition can include
conventional fragrances and/or antibacterial (antimicrobial)
agents as deodorant active materials.

30 Base and cosmetic compositions according to the present

5 invention can easily be manufactured by methods known to those skilled in the art such as by using known mixing procedures. For example, the silicone fluids and siloxane-containing polymers can be mixed at elevated temperatures so as to dissolve the polymer in the silicone fluids, with cosmetically
10 active ingredients being added to the mixture of silicone fluids and polymer. Upon cooling the mixture, the polymer forms a gel from the solution, achieving the desired product. The base compositions of the present invention are thermally reversible gels; that is, they form gels upon being cooled and
15 are liquefied when heated.

Where the product is a stick product, the molten product, at elevated temperatures, can be poured into dispensing containers and allowed to cool and harden therein. Where the product is a soft solid or cream, the product can be packaged
20 into conventional dispensing containers having a top surface with slots therein, as conventionally done in the art.

The compositions according to the present invention can be used as sticks, gels and creams as conventionally used by the consumer. For example, where the compositions of the
25 present invention are a deodorant or antiperspirant composition containing deodorant and/or antiperspirant active materials, the compositions can be rubbed against the skin (for example, in axillary regions of the human body), so as to deposit the active material on the skin in order to reduce
30 body malodor and/or reduce flow of perspiration from, for

5 example, axillary regions.

When a cosmetic composition according to the present invention is in the form of a stick product, the composition can be applied by elevating the stick out of the package so as to expose the end of the stick, and then rubbing the end of
10 the stick on the skin in order to deposit stick material (including the cosmetically active material) on the skin.

When the composition according to the present invention is in the form of a gel composition, packaged in a dispensing container having a top surface with slots or pores, the gel is
15 extruded from the dispensing container through the slots or pores and applied to the skin by rubbing the gel material that has been extruded through the top surface of the container on the skin.

Accordingly, by the present invention a cosmetic
20 composition can be formed using, as a thickening agent, a polymer gelling agent containing siloxane units and hydrogen-bonding groups, so as to have increased compatibility with silicone fluid (such that increased amounts of silicone fluid can be utilized in the composition), yet which can gel from a
25 solution in the silicone fluid. Utilizing this polymer as a thickening agent in the compositions containing silicone fluids, creams, gels and sticks, and soft (and mushy) or firm (and hard) compositions can be formed, depending on the concentration of the thickening agent (including the polymer
30 containing siloxane units and hydrogen-bonding groups)

5 incorporated in the composition. Moreover, various cosmetic compositions can be formed, depending on the cosmetically active materials incorporated, and clear (for example, transparent) cosmetic compositions can be formed. In particular, through use of the present invention, deodorant and/or antiperspirant compositions, in the form of creams
10 (including soft solids and semi-solids), gels and sticks, which have high efficacy, have an attractive appearance (for example, which can be clear or at least translucent), and leave substantially no visible (white) residue either upon application or upon drying, can be achieved.
15

BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1 - 5 schematically show polymer gelling agents, which can be incorporated as a thickening agent in
20 compositions of the present invention, having siloxane units in the main chain, and hydrogen-bonding groups respectively in five different locations of the polymer.

The siloxane units can, illustratively, be provided as part of the main chain of the polymer (for example, the polymer being a siloxane polymer). The hydrogen-bonding
25 groups can be provided as part of the main chain, for example, of a polymer which contains siloxane units in the main chain, at ends of the main chain (terminating the ends of the main chain), or on side chains off the main chain. Various
30 structures of the siloxane polymer are schematically

5 illustrated in Figs. 1 - 5. In these figures, the repeat units x, y and n are variable and can have values (which are actually average values) in the range of:

x = 1-500, more particularly 1-100, and most particularly 1-50;

10 y = 0-500, more particularly 0-100, and most particularly 0-50;

n = 1-500, more particularly 1-300, and most particularly 1-100.

In these figures, reference character 1 represents the siloxane-containing main chain, and reference character 2 represents the hydrogen-bonding group. In Figure 1, the hydrogen-bonding group is provided at the ends of the main chain. In Figure 2, the main chain 1 is tetraterminated by hydrogen-bonding groups 2 (four hydrogen-bonding groups are provided at the ends of the main chain; that is, there are two hydrogen-bonding groups at each chain end, giving four hydrogen-bonding groups per molecule). In Figure 2A, the main chain is tetraterminated by four separate groups, two at each end. In Figure 3, the hydrogen-bonding groups 2 are provided within the main chain 1, as part of the repeating unit. In Figures 4 and 5, the hydrogen-bonding groups 2 are provided on side chains to the main chain 1, pendant to the main chain; Figs. 4 and 5 respectively show structures with one and with two hydrogen-bonding groups on each branch. In the Figures, n, x and y are variable numbers, however n and x each cannot have

5 a value of zero. Particular values for each of n , x and y are selected so that the limitations described for the polymers used as gelling agents are met.

DETAILED DESCRIPTION OF THE INVENTION

10 The invention is described herein as comprising a base composition comprised of at least one silicone fluid and at least one gelling agent (also called thickening agent) selected from a group of compounds containing both siloxane groups and hydrogen bonding groups. If the combined amounts of
15 the silicone fluid and the gelling agent do not equal 100 percent on a weight basis then an additional solvent is also added. Cosmetic compositions may then be made by combining the base composition with one or more additional solvents, active ingredients, one or more vehicles to allow the active
20 ingredient to combine more easily (or with more desirable properties) with the base composition, and other ingredients used by those in the art to formulate cosmetically acceptable products including fragrances, coloring agents, fillers, emollients and antibacterials.

25 In the base composition, the gelling agent can be used in an amount of 1-60 percent by weight, more particularly 5-30 percent by weight and most particularly 10-20 percent by weight. It is preferred that the gellant not exceed 50 percent by weight of the base composition. The silicone fluid portion
30 is in the range of 0.5-95 percent by weight, more particularly

5 10-80 percent by weight, even more particularly 20-75 percent
by weight and most particularly 30-70 percent by weight.
Optionally, additional solvent or mixtures of solvents may be
added to form the base composition. Suitable additional
solvents are those which are either themselves or in mixtures
10 with other solvents miscible in the originally selected
silicone fluid (for example, C14-C20 fatty alcohols, isopropyl
myristate, adipate palmitate and isostearate). By using the
base and cosmetic compositions of the present invention the
upper range of the amounts of silicone fluids which can be
15 incorporated in the gel is higher than amounts which can be
incorporated in conventional compositions.

Optionally the gelling agent can also be endcapped. The
endcapping may be effected with the use of an agent selected
from the group consisting of C1-C20 aliphatic monohydric
20 alcohols, C1-C6 aliphatic amines, phenyl amine optionally
substituted by 1-3 members selected from C1-C6 aliphatics, C1-
C20 aliphatic acids and C1-C20 aliphatic acid chlorides.

The base composition is then mixed with the other
ingredients listed elsewhere so that the final cosmetic
25 composition can be made. Such additional ingredients can be
used in amounts of 0.5-85 percent, more particularly 1-75
percent and even more particularly 2-55 percent where the
percentages are based by weight on the base composition as 100
percent. The lower percent ranges include formulations where
30 only fragrances are used and the upper ranges include

5 formulations containing active antiperspirant ingredients. An antiperspirant active itself (excluding any vehicle for adding the active to the formulation) can be present in the final cosmetic formulation in an amount of from 5-25 percent.

While siloxane units have been defined above, more
10 particular values for R^1 and R^2 are methyl, ethyl and phenyl and an even more particular value for each of R^1 and R^2 is methyl.

While various hydrogen bonding groups have been described above, more particular values for such groups include urea,
15 urethane and amide; and an even more particular group is urea. A particularly preferred polymer is one which contains more than one urea functionality, such as those made with siloxane diamines where $n = 10-300$. A particular polymer is made with a siloxane diamine where $n = 30$ and
20 hexamethylenediisocyanate such as described in Synthetic Example 1 and formulated in Formulation Example 1.

While various silicone fluids have been described above, particular silicone fluids useful in the invention include cyclomethicone, dimethicone and phenyldimethicone.

25 Throughout the present disclosure, the present invention is described primarily in connection with gel or stick antiperspirant and/or deodorant compositions, including clear gel or stick antiperspirant or deodorant compositions. However, the present invention is not limited to gel or stick
30 compositions, or to antiperspirant or deodorant compositions.

5 For example, the composition according to the present invention can be a sunscreen composition. Thus, depending on the cosmetically active ingredients included in the composition, the composition can be any of various cosmetic compositions. Various cosmetically active materials
10 incorporated in cosmetic compositions are disclosed in U.S. Patent No. 4,322,400 to Yuhas, the contents of which are incorporated herein by reference in their entirety.

Throughout the present specification, "antiperspirant active" and "deodorant active" materials are discussed. Both
15 types of materials contribute to reduction of body malodor, for example, axillary malodor. By reduction of body malodor, it is meant that, generally, there is less body malodor after application of the composition to a person's skin, as compared to a person's malodor without application of the composition.
20 Such reduction can be due to a masking of the malodor, absorption and/or chemical reaction of the malodorous material, reduction of the levels of the bacteria producing the malodorous materials, for example, from perspiration, reduction of perspiration, etc. The antiperspirant active
25 materials, when utilized in appropriate amounts, primarily act to reduce malodor by reducing perspiration; the antiperspirant active materials can also have a deodorant function, for example, as an antimicrobial or bacteriostatic agent. The deodorant active materials do not substantially reduce
30 perspiration, but reduce malodor in other ways, for example,

5 as fragrances masking the malodor or reducing the malodor intensity, as absorbents, as antimicrobial (bacteriostatic) agents, as agents chemically reacting with malodorous material.

10 Throughout the present specification, where compositions are described as including or comprising specific components or materials, or where methods are described as including or comprising specific steps, it is contemplated by the inventors that the compositions of the present invention also consist essentially of, or consist of, the recited components or
15 materials, and also consist essentially of, or consist of, the recited steps. Accordingly, throughout the present disclosure any described composition of the present invention can consist essentially of, or consist of, the recited components or materials, and any described method of the present invention
20 can consist essentially of, or consist of, the recited steps.

A desired feature of the present invention is that a clear, or transparent, cosmetic composition, (for example, a clear or transparent deodorant or antiperspirant composition) can be provided. The term clear or transparent (that is,
25 clarity) according to the present invention is intended to connote its usual dictionary definition; thus, a clear, for example, stick or gel antiperspirant composition of the present invention allows ready viewing of objects behind it. By contrast, a translucent composition, although allowing
30 light to pass through, causes the light to be scattered so

5 that it will be impossible to see clearly objects behind the translucent composition. An opaque composition does not allow light to pass therethrough. Within the context of the present invention, a gel or stick is deemed to be transparent or clear if the maximum transmittance of light of any wavelength in the
10 range 400-800 nm through a sample 1 cm thick is at least 35%, preferably at least 50%. The gel or stick is deemed translucent if the maximum transmittance of such light through the sample is between 2% and less than 35%. A gel or stick is deemed opaque if the maximum transmittance of light is less
15 than 2%. The transmittance can be measured by placing a sample of the aforementioned thickness into a light beam of a spectrophotometer whose working range includes the visible spectrum, such as a Bausch & Lomb Spectronic 88 Spectrophotometer. As to this definition of clear, see European
20 Patent Application Publication No. 291,334A2. Thus, according to the present invention, there are differences between transparent (clear), translucent and opaque compositions.

In a particular embodiment of the invention a polyurethane, polyurea, polyurea-urethane or polyamide is used
25 to form a solid composition of the present invention which is a clear, or at least a translucent, gel or stick (for example, antiperspirant gel or stick composition).

This polymer gelling agent, for example, can be a siloxane polymer (siloxane units on the main chain) containing
30 the hydrogen-bonding groups. The thickening agent can consist

5 of this polymer (or a mixture of these polymers), or can
contain this polymer admixed with other thickening agents
(including conventional gelling agents). The siloxane units
provide compatibility with the silicone fluids. The hydrogen-
bonding groups (which are polar groups) are utilized for
10 cross-linking purposes so as to form the gel.

The present invention also contemplates incorporating a
cosmetically active ingredient (such as a fragrance, an
antiperspirant active material, a sunscreen agent, etc.) in
the base composition, so as to form the cosmetic composition.
15 In one particular embodiment of the invention, the base
composition is a gel of the polymer formed from a solution of
the gelling agent (containing siloxane units and hydrogen-
bonding groups) and the silicone fluid and is clear. In
addition, cosmetic compositions according to the present
20 invention, having an active agent incorporated in the base
composition, can also be formulated to be clear such as by
matching the refractive indices of the additional components
to the base composition.

The thickening agent should be included in the cosmetic
25 composition in an amount sufficient to form a composition of a
desired firmness (for example, a cream or soft-solid, gel, or
stick).

The base and cosmetic composition according to the
present invention may be soft (and mushy) or firm (and hard),
30 depending on the amount of the thickening agent included in

5 the composition. Thus, depending on the amount of thickening agent (for example, polymer containing siloxane units and hydrogen-bonding groups) incorporated in the composition, the composition can be in the form of a cream (for example, semi-solid or soft solid) or gel, and can even be formulated as a stick.
10

Compositions according to the present invention are thermoreversible gels; that is, the gels are formed by cooling a solution of the polymer in the silicone fluids, but the gel can be broken (formed back into a liquid) by heating the gel.

15 The gels of the present invention include silicone fluids (for example, silicone liquids). These fluids can be volatile or non-volatile and include, illustratively (and not of a limiting nature), phenyl trimethicone, cyclomethicones and/or dimethicones.

20 Preferably, the silicone fluid includes cyclomethicones. The cyclomethicone used (that is, ring size of the cyclomethicone) has an effect on the hardness of the gels formed. That is, cyclomethicone of a five-member ring (that is, D5 used in Dow Corning 245 fluid) produces a softer gel than that
25 produced utilizing D6 cyclomethicone (Dow Corning 246 fluid). As the ring size of the cyclomethicone increases, the rigidity of the gel system formed increases. As described above, particular examples of suitable cyclomethicones include those having rings of 4-6 members.

30 Where the composition contains an antiperspirant active,

5 any of the known antiperspirant active materials can be
utilized. These include, by way of example (and not of a
limiting nature), aluminum chlorohydrate, aluminum chloride,
aluminum sesquichlorohydrate, zirconyl hydroxychloride,
aluminum-zirconium glycine complex (for example, aluminum
10 zirconium trichlorohydrate gly, aluminum zirconium
pentachlorohydrate gly, aluminum zirconium tetrachlorohydrate
gly and aluminum zirconium octochlorohydrate gly), aluminum
chlorohydrate PG, aluminum chlorohydrate PEG, aluminum
dichlorohydrate PG, and aluminum dichlorohydrate PEG. The
15 aluminum-containing materials can be commonly referred to as
antiperspirant active aluminum salts. Generally, the
foregoing metal antiperspirant active materials are
antiperspirant active metal salts. In the embodiments which
are antiperspirant compositions according to the present
20 invention, such compositions need not include aluminum-
containing metal salts, and can include other antiperspirant
active materials, including other antiperspirant active metal
salts. Generally, Category I active antiperspirant
ingredients listed in the Food and Drug Administration's
25 Monograph on antiperspirant drugs for over-the-counter human
use can be used. In addition, any new drug, not listed in the
Monograph, such as aluminum nitrate hydrate and its combination
with zirconyl hydroxychlorides and nitrides, or aluminum-
stannous chlorohydrates, can be incorporated as an
30 antiperspirant active ingredient in antiperspirant

5 compositions according to the present invention.

Antiperspirant actives can be incorporated into compositions according to the present invention in amounts in the range of 0.1 - 30%, preferably 15 - 25%, by weight, of the total weight of the composition. The amount used will depend
10 on the formulation of the composition. For example, at amounts in the lower end of the broader range (for example, 0.1 - 10%), the antiperspirant active material will not substantially reduce the flow of perspiration, but will reduce malodor, for example, by acting as an antimicrobial material.

15 Where deodorant active materials are incorporated in compositions according to the present invention, so as to provide deodorant compositions, conventional deodorant fragrances and/or antimicrobial agents can be incorporated as the deodorant active materials. A fragrance would,
20 illustratively, be incorporated in an amount of 0.5% - 3.0% by weight, of the total weight of the composition; the antimicrobial/bacteriostat material, such as Triclosan, can illustratively be included in an amount of from 0.1% to about 0.5% by weight, of the total weight of the composition.

25 Compositions according to the present invention can include other ingredients conventionally incorporated in cosmetic compositions, including (but not limited to) perfumes, cosmetic powders, colorants, emulsifiers, etc. As
30 for various other ingredients which can be incorporated, attention is directed to the optional components such as

5 colorants, perfumes and fillers described in the following
U.S. Patents: U.S. Patent No. 5,019,375 to Tanner, et al (the
contents of which are incorporated herein by reference in
their entirety); U.S. Patent No. 4,937,069 to Shin (the
contents of which are incorporated herein by reference in
10 their entirety); and U.S. Patent No. 5,102,656 to Kasat (the
contents of which have been previously been incorporated
herein by reference in their entirety).

Inert fillers, such as corn starch, alumina and calcium
carbonate, can also be incorporated in compositions according
15 to the present invention. However, with these inert fillers
as well as with other optional components, where a transparent
or clear composition is desired, the optional components
should not unduly disadvantageously affect the clarity.

Where the composition is an antiperspirant composition,
20 the composition can also include a solvent for the
antiperspirant active. This solvent, which is not miscible
with the silicone fluid, can illustratively be water, ethanol,
propylene glycol and/or dipropylene glycol. Where the
antiperspirant active is utilized in a solution in the
25 solvent, it may be necessary to match refractive indices of
the antiperspirant active solution with that of the oil
portion of the composition, in order to achieve a transparent
or clear composition. Where the antiperspirant active
material is suspended in the base composition as particulate
30 material, it may also be necessary to match refractive indices

5 of the active material and base composition to obtain a clear or transparent composition. Such refractive index matching is a technique known in the art, and is shown in PCT (International Application) Publication No. WO/05767, the contents of which have previously been incorporated herein by
10 reference in their entirety. The solvent for the antiperspirant active material can be included in the composition in an amount within the range of 0 - 75%, preferably 0 - 25%, by weight, of the total weight of the composition.

15 The solvent for the thickening agent is included in the composition in an amount sufficient such that the thickening agent can be dissolved therein and gelled therefrom, and includes a silicone fluid (for example, a silicone oil, such as cyclomethicone and/or dimethicone). Thus, the thickening
20 agent can be dissolved in the solvent and gelled therefrom, for example, upon cooling the composition during manufacture thereof.

The solvent is not limited to only those materials containing a silicone fluid, and can contain other solvents
25 for the thickening agent as long as such other solvents are compatible with, for example, the active cosmetic material and do not disadvantageously affect, for example, clarity of the composition, especially where it is desired to provide a clear cosmetic composition. For example, as defined in the CTFA
30 International Cosmetic Ingredient Dictionary (4th Ed. 1991),

5 an additional solvent included in the composition can be C12-15 alkyl lactate (which is an ester of lactic acid and C12-15 alcohols); one such C12-15 alkyl lactate is vended by Van Dyk & Co., Inc. as "Ceraphyl 41". Solvents for the polyamide gelling agent disclosed in U.S. Patent 5,500,209 can be used
10 in compositions of the present invention. Illustratively, and not to be limiting, the solvents can include esters (for example, the C12-15 lactate ester described above as Ceraphyl 41), silicone fluids (for example, cyclomethicone, dimethicone), guerbet alcohols having 8-30 carbons,
15 particularly 12-22 carbons (for example, isolauryl alcohol, isocetyl alcohol, isostearyl alcohol), fatty alcohols (for example, stearyl alcohol, myristyl alcohol, oleyl alcohol), ethanol, and ethoxylated alcohols (for example, the polyethylene glycol ether of lauryl alcohol that conforms to
20 the formula $\text{CH}_3(\text{CH}_2)_{10}\text{CH}_2(\text{OCH}_2\text{CH}_2)_n\text{OH}$ where n has an average value of 4 (also called laureth -4)). Other illustrative solvents include:

(a) PPG-14 butyl ether, where the "PPG-14" portion is the polymer of propylene oxide that conforms generally to the
25 formula $\text{H}(\text{OCH}_2\text{C}(\text{CH}_3)\text{H})_n\text{OH}$, where n has an average value of 14;

(b) isopropyl myristate;

(c) PPG-2 myristyl ether propionate which is the ester of propionic acid and the polypropylene glycol ether of myristyl alcohol that conforms to the formula
30 $\text{CH}_3(\text{CH}_2)_{12}\text{CH}_2(\text{OCH}(\text{CH}_3)\text{CH}_2)_2\text{O}-\text{C}(\text{O})\text{CH}_2\text{CH}_3$; and

5 (d) PPG-13 myristyl ether which is the polypropylene glycol ether of myristyl alcohol that conforms to the formula $\text{CH}_3(\text{CH}_2)_{12}\text{CH}_2(\text{OCH}(\text{CH}_3)\text{CH}_2)_n\text{OH}$ where n has an average value of 13. Mixtures of solvents can also be used. Of course, the gelling agent must be soluble in the solvent system, at least at
10 elevated temperatures, as described in U.S. Patent 5,500,209.

Compositions according to the present invention desirably include silicone-miscible emollients. Illustrative emollients, which are not limiting of the present invention, would include guerbet alcohols (such as isocetyl alcohol or
15 isostearyl alcohol); esters (such as isopropyl palmitate, isopropyl isostearate, octyl stearate, hexyl laurate and isostearyl lactate); a liquid mixture of hydrocarbons which are liquids at ambient temperatures (such as petroleum distillates and light mineral oils); and ethanol. The
20 silicone-miscible solvents (also called emollients) can be included in the compositions of the present invention in amounts within the range of 0 - 70%, preferably 0 - 25%, by weight, of the total weight of the composition.

Where a multi-phase system is utilized as the composition
25 of the present invention, preferably the composition includes a surfactant or surfactant blend. Surfactants illustratively include alkanolamides (such as N-alkyl pyrrolidone), ethoxylated amides (for example, the polyethylene glycol amide of tallow acid that conforms generally to the formula $\text{RC(O)-NH-(CH}_2\text{CH}_2\text{O)}_n\text{H}$ where RCO- represents the fatty acids derived
30

5 from tallow and n has an average value of 50 (also called PEG-50 tallow amide)); amine oxides (for example, cocamidopropylamine oxide); ethoxylated carboxylic acids (for example, the polyethylene glycol diester of lauric acid that conforms generally to the formula

10 $\text{CH}_3(\text{CH}_2)_{10}\text{C}(\text{O})-(\text{OCH}_2\text{CH}_2)_n\text{O}-\text{C}(\text{O})(\text{CH}_2)_{10}\text{CH}_3$, where n has an average value of 8 (also called PEG-8 dilaurate)); ethoxylated glycerides (for example, a polyethylene glycol derivative of Castor Oil with an average of 4 moles of ethylene oxide (also called PEG-4 castor oil)); glycol esters (for example,

15 propylene glycol ricinoleate); monoglycerides (for example, glycerol myristate); polyglyceryl esters (for example, polyglyceryl-4 oleyl ether); polyhydric alcohol esters and ethers (for example, sucrose distearate); sorbitan/sorbitan esters (for example, sorbitan sesquiisostearate); triesters of

20 phosphoric acid (for example, trioeth-8 phosphate (a material which is predominantly the triester of phosphoric acid and ethoxylated oleyl alcohol with an average of 8 moles of ethylene oxide)); ethoxylated alcohols (for example, laureth-4); ethoxylated lanolin (for example, a polyethylene glycol

25 derivative of Lanolin with an average of 20 moles of ethylene oxide (also called PEG-20 lanolin)); ethoxylated polysiloxanes (for example, dimethicone copolyol); propyloxated polyoxyethylene ethers (for example, the polyoxypropylene, polyoxyethylene ether of cetyl alcohol that conforms generally

30 to the formula $\text{CH}_3(\text{CH}_2)_{14}\text{CH}_2(\text{OCH}(\text{CH}_3)\text{CH}_2)_x(\text{OCH}_2\text{CH}_2)_y\text{OH}$ where x has

5 an average value of 5 and y has an average value of 20 (also called PPG-5 ceteth-20)); and alkylpolyglycosides (for example, lauryl glucose). The surfactant (or surfactant blend) includes non-ionic compounds, and can also include blends thereof with cationic (for example, the polyethylene glycol amine of tallow acid that conforms generally to the
10 formula $R-NH-(CH_2CH_2O)_nH$ (also called PEG-15 tallow amine)) or anionic (for example, sodium lauroyl laurate which is the sodium salt of the lauric acid ester of lauric acid) surfactants.

15 The surfactant or blend thereof incorporated in compositions according to the present invention can, illustratively, be included in amounts of 0 - 15%, preferably 0 - 4%, by weight, of the total weight of the composition.

As indicated previously, the compositions according to
20 the present invention can be creams (semi-solids or soft-solids), gels or sticks, depending on amounts of thickening agent incorporated in the composition. It is difficult to quantitatively distinguish between a cosmetic "gel" and a cosmetic "stick". Generally, a gel is more viscous than a
25 liquid or than a paste which fails to retain its shape; however, it is not as rigid as a stick. Typically, it is understood that gels are soft, deformable products while sticks are free-standing solids. In the cosmetic field, systems are classified as gels or sticks depending on their
30 viscosity or hardness alone; typically, it is understood that

5 gels are soft, deformable products while sticks are strictly
free-standing solids. For example, by rheological analysis, a
commercial deodorant stick has been determined to have a
plateau storage modulus $G'(\omega)$ of roughly 10^5 Pa and a complex
viscosity of 10^6 Pa second (both at an angular frequency of 0.1
10 rad-sec). On the other hand, a commercial antiperspirant gel
has been determined to have a $G'(\omega)$ value of roughly 10^3 Pa and
a complex viscosity of 10^4 Pa second (at 0.1 rad-sec).

Cosmetic compositions according to the present invention
include both a thickening agent and a solvent for the
15 thickening agent (in the present application, the thickening
agent and solvent for the thickening agent provide a vehicle
for the active cosmetic material, and have been so designated
as a vehicle).

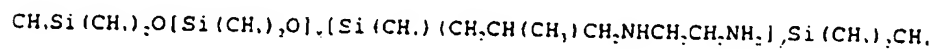
The polymer gelling agents utilized according to the
20 present invention can be defined in terms of techniques
utilized for forming these polymers. For example, for one
particular group the polymer gelling agent may include
siloxane copolymers in which a siloxane diamine is reacted
with a diacid and/or diacid derivative (generically called
25 diacids), diisocyanate or a diisothiocyanate to produce a
copolymer with amide groups, a copolymer with urea groups, and
a copolymer with thiourea groups, respectively. A second
group of polymer gelling agents that can be incorporated in
compositions according to the present invention include
30 siloxane polymers in which a siloxane diacid and/or diacid

5 derivative is reacted with a diol or diamine, to produce
copolymers with ester or amide groups, respectively.
Copolymers with ester groups would need to be used with other
copolymers having, for example, urea or amide groups, or the
copolymers with ester groups would also need to have, for
10 example, urea or amide groups, in order to achieve hydrogen
bonding, as discussed previously. A third group of
illustrative copolymers is those in which a siloxane diol is
reacted with a diisocyanate, to produce a polyurethane.

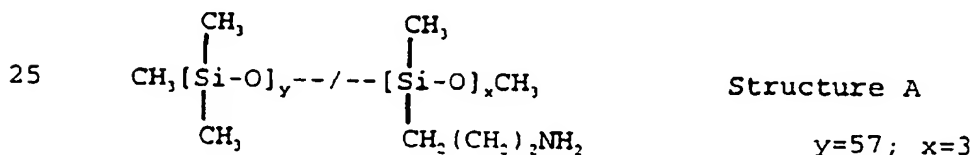
The polymer can have the hydrogen-bonding groups
15 terminating the ends of the main chains. For example,
bifunctional and tetrafunctional terminated siloxane polymers
can be reacted so as to form biterminated and tetraterminated
siloxane polymers, terminated with hydrogen-bonding groups.

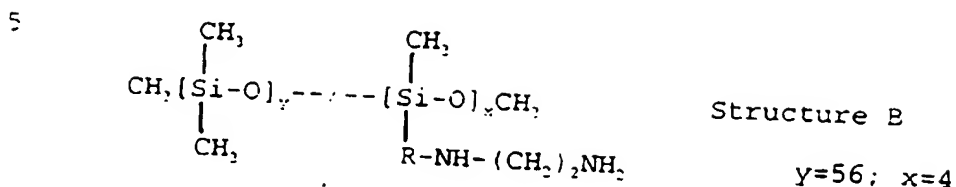
A polymer of this invention containing siloxane units and
20 hydrogen-bonding groups can also be a siloxane polymer formed
by reacting comb-branch siloxane polymers having pendant amino
groups (for example, amino groups on a side chain), with an
acid, isocyanate and/or isothiocyanate, to form polymers with
amide, urea and/or thiourea groups. Thus, these comb-branch
25 siloxane polymers are reacted with mono-functional compounds,
for example, mono-isocyanates, to form the polymers containing
siloxane units and hydrogen-bonding groups acting as
thickening agents in the compositions of the present
invention. The comb-branch siloxane polymers may have a
30 single amino group per branch (for example, aminopropyl

5 branches) or, alternatively, may have diamino branches (for
 example, aminoethylaminopropyl or aminoethyl-aminoisobutyl
 branches), or could contain a mixture of amino and diamino
 branches. An illustrative siloxane polymer with diamino
 branches is an amino-functional silicone polymer such as Dow
 10 Corning Q2-8220 fluid (trimethylsilylamodimethicone) which is
 a silicone polymer conforming generally to the formula



15 where x and y are proprietary to Dow Corning. As with all of
 the siloxane polymers which can be incorporated in
 compositions according to the present invention, the length of
 the main chain (that is, number of siloxane units) can be
 varied to optimize properties of the gellant; moreover, using
 20 comb-branch siloxane polymers, density of the branches could
 be varied to optimize properties of the gellant. The
 following structures (A) and (B) show illustrative comb-branch
 siloxanes, respectively having amino and diamino branches:





10 where the "/" mark indicates that the segments can be of varying lengths and in random order and where R = a straight chain aliphatic group, preferably having 1-6 carbons and more preferably having 1-3 carbons.

15 Illustratively, the polymer containing siloxane units and hydrogen-bonding groups can be formed by reacting a siloxane polymer, having at least three amino groups per polymer molecule, with a compound having a single monofunctional group, respective monofunctional groups (for example, an acid, isocyanate or isothiocyanate) reacting with one of the amino groups to form the hydrogen-bonding groups.

20 The amino groups can be on side chains extending from the main chain of the siloxane polymer, whereby the hydrogen-bonding groups are formed on these side chains; or the amino groups can be at ends of the main chain, whereby the hydrogen-bonding groups are terminating groups of the polymer (for example, where four amino groups are provided on the polymer reactant, two on each end, the polymer product having hydrogen-bonding groups is a tetraterminated polymer).

25 As a specific procedure for forming a polymer containing siloxane units and hydrogen-bonding groups and then forming the composition of the present invention, the polymer can be

30

5 produced by reaction of, for example, a siloxane diamine and a diisocyanate in a silicone solvent, so as to directly provide the gel. That is, reaction of the components to form polymers or copolymers containing siloxane units and hydrogen-bonding groups can be performed in the silicone fluid, the resulting
10 product being dissolved in the silicone fluid, at elevated temperatures, with the temperature of the system then being decreased to form the gel.

Preferred polymers for incorporation in compositions according to the present invention are siloxane/urea
15 copolymers which are linear and which contain urea groups as hydrogen-bonding groups in the backbone of the polymer.

An illustrative polysiloxane terminated with four urea groups (tetraterminated polysiloxane) is represented by the following Formula (I), which is the reaction product of a
20 siloxane polymer with phenyl isocyanate as shown in the following Reaction Scheme I:

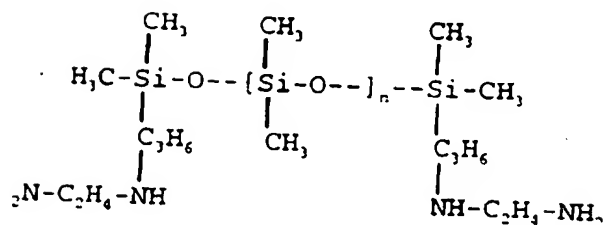
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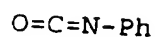
REACTION SCHEME I

10



(n~50)

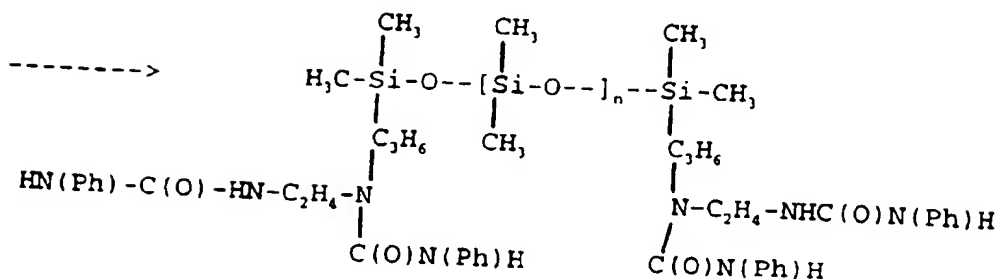
+



(Ph= phenyl)

15

20



Formula I

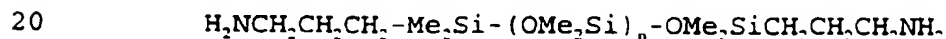
where Ph= phenyl, and n is an average and is a number from 0-300, particularly 0-100 and, for example, 50.

The tetraterminated polymer is optically clear, and soluble in chloroform, tetrahydrofuran and acetone. It swells silicone fluids such as cyclomethicone (Dow Corning 345 fluid) and dimethicone (Dow Corning 200 fluid). The cyclomethicone can be gelled at room temperature with the polymer of Formula I, when the weight percent of the polymer is roughly 50% of the total weight of the composition. The final gel has a

5 melting point of about 25°C and is isotropic, transparent and colorless.

It should be noted that endcapping of polymers of Formula I may also be accomplished with the use of an agent selected from the group consisting of C1-C20 aliphatic monohydric
10 alcohols, C1-C6 aliphatic amines, phenyl amine optionally substituted by 1-3 members selected from C1-C6 aliphatics, C1-C20 aliphatic acids and C1-C20 aliphatic acid chlorides.

Another illustration of such copolymerization utilizes an oligosiloxane which is terminated at both ends with
15 α-aminopropyl groups. Such an oligosiloxane is called a siloxane diamine, a diamino siloxane oligomer, or α, ω-bis (aminopropyl) oligodimethylsiloxane. Such oligomers would have the following structure designated as Formula III:



Formula III

where n has an average value from 1-300 with more particular
25 values being 10-100, even more particular values being from 10-40 and a particular group being 10-30 and Me = methyl. One example of a monomer of Formula III is available in various average lengths including 9-300 from United Chemical Technologies (Bristol, Pennsylvania), Wacker Silicones
30 (Adrian, Michigan), Shin Etsu (Tokyo, Japan) and Gelest (Tullytown, Pennsylvania).

The copolymer made from diamines and either diacids or

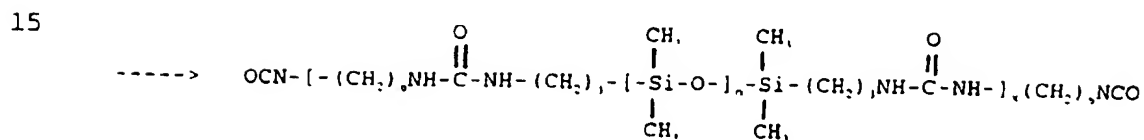
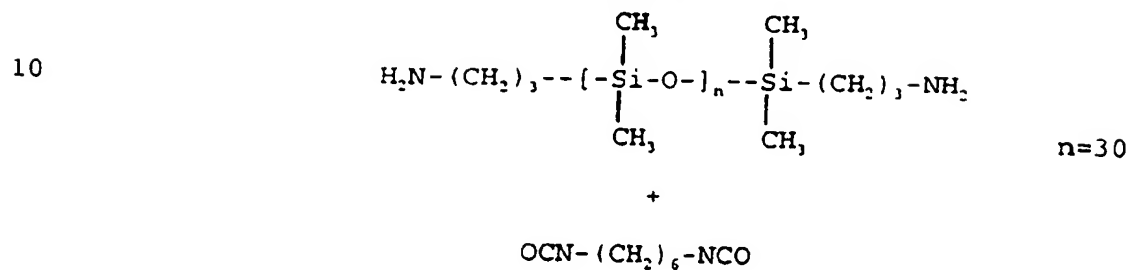
5 diisocyanates can include the siloxane diamine as the sole
diamine material in forming the copolymer, or preferably the
copolymer can also include additional diamine (such as
10 ethylene diamine and/or hexamethylene diamine). Including
such additional diamine would aid in producing a solid
polymer, which can be useful in gelling fluids. Desirably,
the siloxane diamine has n (as an average) equal to at least
10, (for example, as applied to Formula III) to provide better
products.

15 While the value for n as the average number of repeating
siloxane units in each occurrence of the polymer used as the
gelling agent has been broadly described as 1-300, it is
preferred that the value for n be between 10 and 30.
Siloxanes with low " n " are relatively expensive, while
siloxanes with high " n " (n greater than 30) may be difficult
20 to react.

Illustratively, siloxane/urea copolymers are produced by
reacting siloxane diamine with hexamethyldiisocyanate, and
then end-capping. The endcapping can, illustratively, be
performed using aniline as an endcapper to form phenyl urea
25 end groups; other amino-containing compounds (such as diethyl
amine) could also be used as endcappers. In addition alcohols
and other suitable reagents may be used. Reaction Scheme II is
shown below, to form these copolymers, with the siloxane/urea
copolymer shown by the structural Formula II which is then
30 terminated with aniline to produce phenyl urea end groups or

- 5 hydrolyzed (for example, in the presence of base) to form amine end groups.

REACTION SCHEME II



Formula II

- 20 where x has an average value of 1-100 and particularly has a value in the range of 2-40.

This siloxane/urea copolymer of Formula II, then terminated with phenyl urea end groups, softens at 120°C, and about 15% by weight is required to gel cyclomethicone. The

25 gel can be produced by the following procedure: The siloxane/urea copolymer of Formula II, terminated with phenyl urea end groups, and the cyclomethicone are heated above 160°C and stirred, whereby a clear solution is formed. Gelation occurs on cooling to room temperature; such gels are

30 completely transparent, with their hardness determined by the concentration of polymer. The melting point of the gel is

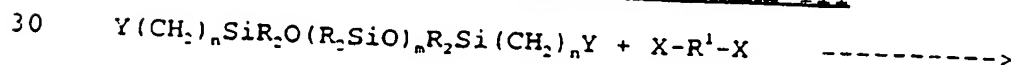
5 dependent on the concentration of the polymer.

One example of the present invention incorporates polyamides having at least one siloxane group as a vehicle for a solid cosmetic composition, for example, a gel or a stick composition, the vehicle containing a thickening agent and a solvent for the thickening agent, wherein the solvent includes a silicone fluid, and the amide thickening agent includes silicon-containing moieties to enhance compatibility of the silicone fluid in the composition. Embodiments of the present invention also include a solid cosmetic composition containing a cosmetically active ingredient in this vehicle.

An illustrative thickening agent includes, for example, an amide thickening agent which has silicon-containing moieties. According to one aspect of the present invention, such amide thickening agent is a polyamide gelling agent having silicon-containing moieties. Such silicon-modified polyamide can be formed by a copolymerization technique, which involves polymerizing the polyamide from monomers which include a siloxane monomer. For example, the silicon-modified polyamide can be a copolymer which is the product of copolymerization of a dicarboxylic acid with diaminosiloxane oligomers.

Generally, selected copolymers can be produced utilizing the following Reaction Scheme III:

REACTION SCHEME III



5 $-[C(=O)NH(CH_2)_nSiR_2O(R_2SiO)_mP_2Si](CH_2)_nNHC(=O)-R^1]X-$

where:

R at each occurrence is independently selected from the group consisting of methyl, ethyl, propyl, isopropyl and phenyl

wherein the phenyl may optionally be substituted by 1-3

10 members from the group consisting of methyl and ethyl; more particularly R can be methyl, ethyl and phenyl; and especially methyl;

R^1 is an alkyl chain having 1-40 carbons, particularly 2-20 carbons and especially 2-6 carbons optionally substituted by a
15 member selected from the group consisting of C1-C4 alkyl, phenyl, hydroxyl, carboxyl and amino and, more particularly, from the group consisting of methyl, ethyl, propyl, isopropyl phenyl, and hydroxyl and optionally containing at least one alkenyl or aromatic group in the main chain or in a pendent
20 group;

$X = NH_2$ when $Y = CO_2H$ and $X = CO_2H$ when $Y = NH_2$. Thus, as seen in the foregoing reaction, the silicone-containing monomer can be either the diacid or the diamine.

Mixtures of diacids (dicarboxylic acids) as well as
25 mixtures of diamines can be used in the polymerization. Illustrative diacids for making the copolymer include dimer acids (hydrogenated or non-hydrogenated), adipic acid, butanedioic acid, tartaric acid, gluconic acid, oxalic acid, diglycolic acid, malonic acid, succinic acid, glutaric acid,
30 malic acid, maleic acid, dodecanedioic acid, terephthalic acid

5 and isophthalic acid, and mixtures. If a silicon-based
dicarboxylic acid is used, a variety of diamines could be used
to make the polyamide (for example, ethylene diamine,
hexamethylene diamine, piperazine, phenylenediamine,
decamethylene diamine, xylene diamine, polyethylene glycol
10 diamine. Also, diamines containing silicone may be used such
as those having segments of 1-300 siloxane groups.

Alternatively, the silicon-containing polyamide gelling
agent can be produced by silyl amidation of dimer-based
polyamides. This approach involves the reaction of free acid
15 sites existing on an original polyamide as terminal sites,
with oligosiloxane-amines and/or oligosiloxane-diamines
(amidation reaction), or alternatively with oligosiloxane-
alcohols or oligosiloxane-diols (esterification reaction).
The esterification reaction requires the presence of acid
20 catalysts, as known in the art. It is desired that the
polyamide having free acid sites, utilized for the amidation
or esterification reaction, have a relatively large number of
acid end groups (for example, polyamides with high acid
numbers of, for example, 15-20).

25 For the amidation of free acid sites of polyamides,
illustratively (and not to be limiting) siloxane diamines with
n (siloxane groups) equal to 1-300, more particularly 2-50 and
even more particularly selected from the group consisting of
2, 6, 9.5, 12, 13.5, 23 and 31 can be used for reaction with
30 dimer-based polyamides. The most preferred value for n is

5 13.5. Best results have been achieved with the siloxane
diamine having $n = 13.5$, and with polyamides containing high
levels of carboxylic acid end-groups. Reactions were
performed either in xylene to extract produced water from the
solution by azeotropic distillation, or at higher temperatures
10 (around 180°C-200°C) without solvents. Typically, the
efficiency of the amidation and reaction rates decrease when
the siloxane diamine is longer (higher n). Free amine sites
can be capped after the initial amidation reaction of diamino-
siloxanes by reacting with either siloxane acid or an organic
15 acid such as benzoic acid.

For the esterification of free acid sites on polyamides,
this can be performed in boiling xylene with about 1% by
weight (of the total weight of the reaction materials) para
toluene sulfonic acid as catalyst.

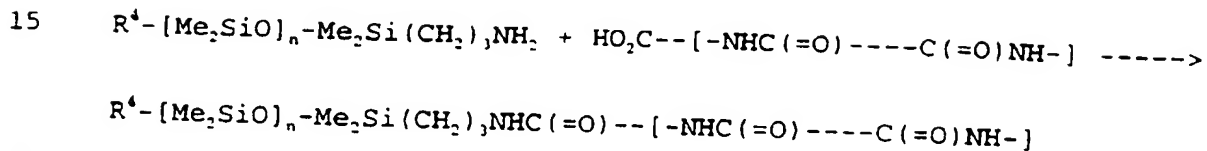
20 In the amidation of the free acid sites, cyclomethicone
incorporation ability increases as the number of siloxane
groups/amide group increases, as shown below in Table 2:

TABLE 2

siloxane groups/amide group	clear gels with maximum % of cyclomethicone in solvent
0	40
0.5	55
1.3	55
2.6	59

5 An example of this amidation is shown in the following
Reaction Scheme IV:

10 REACTION SCHEME IV



20 where R^4 is selected from the group consisting of hydrogen, methyl, ethyl, propyl and isopropyl, butyl, and straight chain and branched amino alkyls having 1-4 carbons (particularly aminopropyl); and n (average value) is selected to be 1-40, particularly 1-30, more particularly 1-25, with a particular
 25 group being a value selected from the group consisting of 1, 2, 3, 7, and 21; and Me = methyl. The product of this reaction provides a polyamide backbone with siloxane termination sites.

In these reactions, silicone moieties are incorporated
 30 only at the chain ends. The resulting polymers have relatively large compatibility with silicone fluids, the enhanced compatibility being greater when the starting (original) polyamides have high acid numbers.

35 Illustratively, but not by way of limitation, the original polyamide can be a dimer based polyamide hot melt adhesive resin such as Unirez 2973, from Union Camp Corp. This polyamide has 5% to 10% free acid sites.

5 If siloxane diamines are used (that is, an amidation reaction is used), a free amine group is incorporated into the polymer. This free amine group can be reacted with various organic or silicone-based carboxylic acids (for example, disiloxane-dipropionic acid) to produce another amide bond.

10 It is thought that the final product should not have free amine sites, because these groups may result in lower product stability.

 Preferably, the silicone-modified polyamide formed by this silyl amidation is obtained by reacting high acid
15 polyamide with oligosiloxane diamines having an average from 10 to 13 repeating siloxane units. The reactants were refluxed in xylene using a reaction assembly consisting of a azeotropic finger to constantly extract the generated water.

 If the original polymer (polyamide) contains free amine
20 sites, rather than free acid sites the siloxane reagent should contain an acid group instead of the amine to enable the amidation reaction.

 As a third alternative for providing the silicon-modified polyamide gelling agent, an original polyamide having, for
25 example, an ethylene diamine component is reacted with an oligosiloxane diamine at elevated temperatures (for example, 200°C to 300°C) so as to perform transamidation whereby the ethylene diamine component in the original polyamide is replaced by the oligosiloxane diamine. It is preferred that
30 the level of replacement be at most 50%, so as to limit

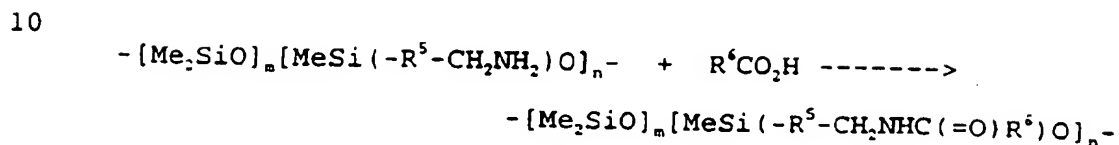
5 reduction of the gelation capability by the polyamide.
Polyamides modified by transamidation in this way exhibit
greater compatibility with silicone fluids (for example, clear
gel compositions can be produced in which the solvent system
is approximately 60% cyclomethicone).

10 For performing the transamidation, illustratively the
original polyamide can be polyamides as described in U.S.
Patent 5,500,209, referred to previously, or a polyamide with
a high acid number. The transamidation takes place at
temperatures above 200°C. When higher temperatures are used,
15 reaction time is very short (for example, 0.5 hours to 300°C).
Siloxane diamines with n (number of siloxane groups) from 10
to 15 are most suitable for these reactions. Free amine sites
formed during the transamidation can be capped by reaction
with either siloxane carboxylic acid or an organic acid such
20 as benzoic acid. Polyamide chains can also be broken during
the transamidation. The polymer products obtained are not as
hard as those formed by end-site amidation reactions; however,
they are less sticky. This reaction is very simple and easily
controlled.

25 A still further alternative approach to form the silicon-
modified polyamides is the reaction of polysiloxanes bearing
amino or acido alkyl groups which can react with organic acids
or amines respectively to provide a polyamidosiloxane, having
oligosiloxane groups. Aminopropyl siloxane copolymers, as the
30 original polymer to be reacted with an organic acid, are

5 commercially available. This approach is illustrated in the following Reaction Scheme V:

REACTION SCHEME V



where:

R^5 is selected from the group consisting of -NH-; straight chain and branched C1-C40 alkylenes optionally containing at least one double bond or phenylene group, with particular values for R^5 being C1-C20, more particular values being C2-10, and an even more particular value being ethylene;

R^6 is selected from the group consisting of C1-C40 aliphatics and phenyl, and more particularly, C1-C10 and phenyl;

25 n and m are average values and are each independently selected from the range 1-1000, particularly 1-100 and more particularly from 1-50; and Me = methyl. The polymer skeleton in this case is based on siloxane monomeric units and the amide groups are pendant.

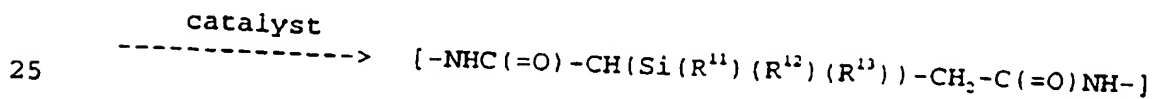
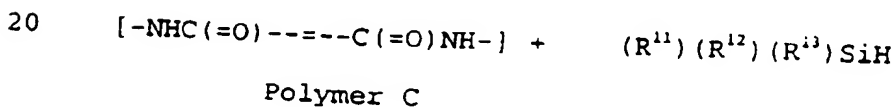
30 In addition to the foregoing, original polyamides (not containing silicon moieties) can be modified, with the modified polyamides utilized in the composition of the present invention as the polyamide gelling agent, by grafting the

5 polyamide with pendant oligosiloxane groups. This can be done in many ways, including (but not limited to):

- (a) hydrosilylation of unsaturated bonds in non-hydrogenated dimer-based polyamides;
- (b) silylation of the amide groups in polyamides; and
- 10 (c) silylation of unsaturated polyamides via oxidation.

The substitution by hydrosilylation reaction of unsaturated functional groups found in the polymeric skeleton as integral species of the dimer acid used as the copolymeric unit in the polyamide provides very stable Si-C bonds. This approach is shown by the following Reaction Scheme VI where Polymer C is a dimer based polyamide such as one made with non-hydrogenated dimer acid + ethylene diamine:

REACTION SCHEME VI



where each of R^{11} , R^{12} and R^{13} are independently selected from the group consisting of methyl, ethyl, propyl, isopropyl, butyl, isobutyl, phenyl and a siloxyl group of Formula IV:
30 $\text{CH}_3-\text{Si}(\text{CH}_3)_2-\text{O}-[\text{Si}(\text{CH}_3)_2-\text{O}]_n$ where n is an average and is a number in the range of 1-100.

5 Examples of suitable values for " $(R^{11})(R^{12})(R^{13})SiH$ " are, illustratively: $(CH_3)_rSiH$, $(CH_3)_rPh_{3-r}SiH$ (where r is a number from 0-3), $(CH_3)_rSiO-[(CH_3)_2SiO]_n-(CH_3)_2SiH$ (where n is an average and is a number from 1 to 100), and $(CH_3)_rBu_{3-r}SiH$ (where Bu is butyl and r is a number from 0-3).

10 Examples of suitable values for catalysts are organometallic catalysts such as: H_2PtCl_6 , $Ru_3(CO)_{12}$, $(Ph_3P)_3RhCl$, and others which have the effect of lowering the activation energy of the reaction.

15 In the present situation (hydrosilylation of unsaturated bonds), as well as in the other reaction schemes described herein, the R groups of the silylated compounds, and the number of substitutions on the polymer, can affect polymer properties (for example, lubricity, crystallinity).

20 In forming polyamides by hydrosilylation of unsaturated bonds, it is preferred to use original polyamides having higher concentrations of unsaturation. This can be accomplished by forming the original polyamide using a highly unsaturated dimer acid, or using various diacids (such as itaconic acid, malic acid, maleic acid, etc.) which contain reactive groups, 25 or by end-capping with an unsaturated mono-acid (such as linoleic acid). In these cases, the polymers are first reacted with siloxane amines or alcohols to eliminate any free acid sites, and then completely dried. After these steps, the hydrosilylation is performed.

30 As mentioned previously, the silicon-containing polyamide

5 gelling agents utilized in the present invention can be formed
by silylation of amide groups in original polyamides. This
provides substitution on the amide functional sites. This
substitution on the amide functional sites is by catalytic
10 reaction between an hydrido substituted silane ("SiH") and the
amide, which can lead to the formation of three potential
substituted arrangements, as shown in the following Reaction
Scheme VII:

REACTION SCHEME VII

15

$--NH-C(O)-- + (R^{11})(R^{12})(R^{13})SiH \xrightarrow{\text{catalyst}}$

gives the following possible products at that reaction site:
 $-NH-CH(O-Si(R^{11})(R^{12})(R^{13}))-$; $-C(O)N-Si-(R^{11})(R^{12})(R^{13})-$; and
 $-N=C(O-Si(R^{11})(R^{12})(R^{13}))-$.

20

While silylation of the amide groups improves
compatibility with the silicone oils, destruction of the amide
groups reduces gellation capabilities.

In addition, the silicon-modified polyamides can be
formed by silylation of unsaturated polyamides via oxidation.
 25 That is, the unsaturated groups can be oxidized to alcohols or
diols and then the newly developed hydroxyl groups can be
reacted with either siloxane carboxylic acids or siloxane
alcohols. Alternatively, the olefinic sites of the
unsaturated polyamides can be epoxidized, followed by typical
 30 epoxy-ring opening with siloxane amines or siloxane alcohols.

5 In a series of preferred embodiments base compositions and cosmetic compositions according to the present invention contain a sufficient amount of the thickening agent such that the final cosmetic composition is a solid composition, for example, a gel or stick.

10 The composition according to the present invention can include other ingredients conventionally incorporated in solid cosmetic compositions, for example, deodorant or antiperspirant gels and/or sticks, particularly if clarity is not a factor. These other ingredients could include an active
15 phase (which may include water or glycol), waxes, other thickeners, surfactants, stabilizers, color and fragrance. As for various other ingredients which can be incorporated, attention is directed to the optional components such as hardeners, strengtheners, chelating agents, colorants,
20 perfumes, emulsifiers and fillers, described in the various patent documents listed in the following, all incorporated by reference herein in their entirety:

U.S. Patent No. 3,255,082 to Barton;

U.S. Patent No. 4,049,792 to Elsanu;

25 U.S. Patent No. 4,137,306 to Rubino, et al.; and

U.S. Patent No. 4,279,658 to Hooper, et al.

Attention is also directed to U.S. Patent 5,500,209 for various optional components, and amounts thereof, which can be incorporated in the composition of the present invention.

30 The degree of freedom in incorporating optional

5 ingredients is increased where a clear composition is not being formed (for example, where a translucent composition, or, especially, where an opaque composition, is being formed).

Base compositions according to the present invention can be made by mixing the various components at an elevated
10 temperature (that is, by heating and mixing the various components) and then cooling in order to form the gelled (solidified) composition, for example, as a gel or stick. For cosmetic compositions, the additional ingredients are added using techniques and at times in the manufacturing process as
15 are known to those in the art. Desirably, any volatile components (such as fragrances) are added to the mixture at a relatively late stage of the mixing, so as to limit volatilization of the volatile components.

Generally, the solvent and thickening agent (for example, the polyamide gelling agent) are mixed and heated so as to
20 fully dissolve the thickening agent in the solvent. An active ingredient (for example, antiperspirant active material, for example, in dry form or as part of a solution) can be added after the thickening agent fully dissolves, and mixing then
25 takes place. Mixing continues with cooling, with, for example, colorant and fragrance then being added. Thereafter, the resulting composition, still liquid, is poured into canisters, for example, dispensing packages, and solidified, as with conventional stick and gel compositions.

30 The compositions according to the present invention may

5 be used in the same manner as conventional gel or stick
compositions, dispensed from, for example, dispensing
containers. For example, the gel or stick, exposed out of the
dispensing package, is rubbed on skin, so as to deposit the
active material (for example, antiperspirant and/or deodorant
10 active materials) on the skin.

Illustratively, where a composition is an antiperspirant
composition containing an antiperspirant active material for
reducing perspiration in the axillary regions, and exposed
portion of the composition is rubbed against axillary regions
15 of the human body, so as to deposit the antiperspirant active
material and, if present, deodorant active material, on the
skin in the axillary region. The composition, both during the
deposition on the skin and after application, has reduced
tackiness and stickiness, as discussed previously.

20 In the following, illustrative contemplated examples of
compositions within the scope of the present invention are set
forth. These contemplated examples are illustrative of the
present invention, and are not limiting. Amounts of
components in these examples are in weight percent, of the
25 total weight of the composition.

Compositions according to the present invention can be
made by the following procedure. This procedure is
illustrative and not limiting of the present invention. The
polymer can be dissolved in the silicone fluid, for example,
30 at elevated temperatures (for example, up to 160°C) so as to

5 form a solution, with cooling then being performed to form the gel. It is preferred that the solution is not heated too long or at too high a temperature, since such disadvantageously may cause the gel to be colored (rather than clear and colorless). The cosmetic active can be added to the solution of silicone
10 fluid and polymer gelling agent and mixed therewith so as to be homogeneously distributed in the product.

The cosmetic composition according to the present invention can be packaged in conventional containers, using conventional techniques. For example, where the composition
15 is a stick composition, the composition, while still in liquid form, can be introduced into a dispensing package as conventionally done in the art, and cooled therein so as to thicken in the package. Where a gel or soft-solid cosmetic composition is produced, the composition can be introduced
20 into a dispensing package (for example, a package having a top surface with slots or pores) as conventionally done in the art. Thereafter, the product can be dispensed from the dispensing package as conventionally done in the art, to deposit the active material, for example, on the skin. This
25 provides good deposition of the active material on the skin.

For example, where the product is a solid stick product, the product can be elevated out of the dispensing package so as to expose an end of the stick, which exposed end can then be rubbed on the skin to deposit the composition, including
30 active material, on the skin. Where the product is a gel or

5 soft-solid, the product can be dispensed by extruding the product from the dispensing package onto the top surface of the package, through pores or slots in the top surface, and then rubbing the exposed product on the skin so as to deposit the active material on the skin.

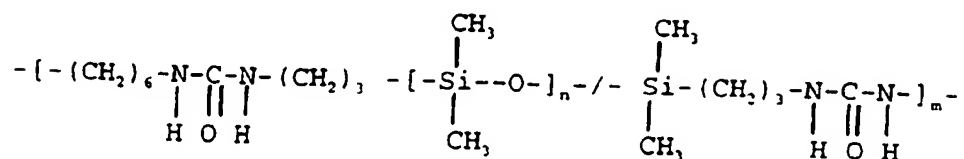
10 In the following, specific synthesis examples for forming siloxane polymers having hydrogen-bonding groups are set forth, and specific examples of compositions within the scope of the present invention are set forth. These specific synthesis examples and examples are illustrative in connection
15 with the present invention, and are not limiting. In the following, as well as throughout the present disclosure, names utilized are the CTFA (Cosmetics, Toiletry and Fragrance Association, Inc.) names, as set forth in the CTFA International Cosmetic Ingredient Dictionary (4th Ed. 1991),
20 the contents of which dictionary are incorporated herein by reference in their entirety.

Synthesis Example 1

25 A main-chain siloxane-urea copolymer is synthesized in tetrahydrofuran (THF) as solvent. A solution of 1 molar part of hexamethylene diisocyanate is added dropwise to a solution of 1 molar part of a liquid telechelic diamino siloxane (molar mass: 2500 g/mol.). The solution becomes viscous at the end of the addition. After the polymerization the solvent is
30 removed by evaporation, a clear and colorless polymer is

5 obtained (molar mass: 31030 g/mol; molecular weight distribution: 1.9; determined by gel permeation chromatography (GPC) (polystyrene standard)).

10 Copolymer of Synthesis Example 1:



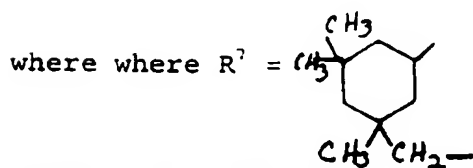
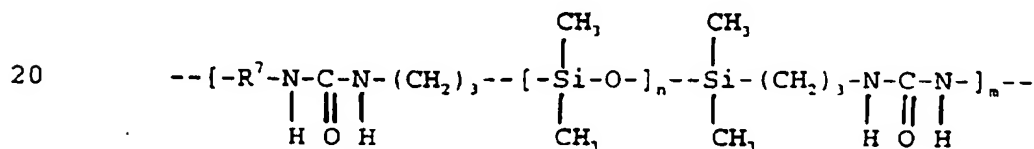
15 where n has an average value of 1-30 and m has an average value of 1-12, and wherein the polymer can contain various n and m units each of which can have a different number and may be randomly arranged.

20 Synthesis Example 2

A main-chain siloxane-urea copolymer is synthesized in THF as solvent. A solution of 1 molar part of isophorone diisocyanate is added dropwise to a solution of 1 molar part of a liquid telechelic diamino siloxane (molar mass: 2500 g.mol). (Note: A polymer can be considered telechelic if it contains end groups that react selectively to give a bond with another molecule, including for chain extension by means of bifunctional linking agents. Telechelic materials can be called macromolecular monomers, macro monomers, or macromers,

5 or reactive oligomers and contain repeating units such as
 $Z^1-(A)_n-Z^2$ where Z^1 and Z^2 are reactive acids, A = a chain for
 example, containing aliphatic and/or aromatic units or
 siloxane units), and $n > 1$. More concisely, they are molecules
 which have reactive ends and which contain repeating units in
 10 the molecule. The solution becomes viscous at the end of the
 addition. After the polymerization the solvent is removed by
 evaporation. The resulting polymer is dissolved in THF and
 diethyl amine is added. After the reaction the solvent is
 removed by evaporation, yielding a clear and colorless polymer
 15 (molar mass: 50090 g/mol.; molecular weight distribution:
 2.2; determined by GPC (polystyrene standard)).

Copolymer of Synthesis Example 2:



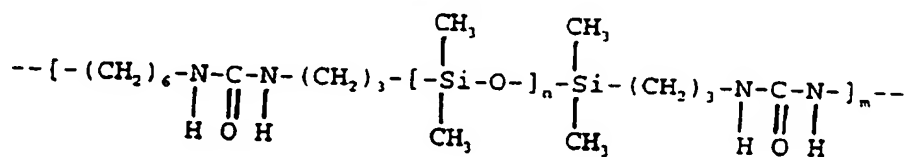
25 n has an average value of 30 and m has an average value of
 19, and wherein the polymer can contain various n and m units
 each of which can have a different number and may be randomly
 arranged. Note that in other embodiments of this copolymer n
 may be selected to be in the range of 1-303, particularly 1-
 30 100, more particularly 1-30, and may be selected to be in the

5 range of 1-19.

Synthesis Example 3

A main-chain siloxane-urea copolymer is synthesized in cyclomethicone (Dow Corning 245 fluid). 1 molar part of
 10 hexamethylene diisocyanate is dispersed in Dow Corning 245 fluid at room temperature. It is not soluble in the solvent at room temperature. The mixture is heated up to 90°C. The mixture becomes homogeneous. Now a solution of 1 molar part of a telechelic diamino siloxane (molar mass: 2500 g/mol) is
 15 added dropwise. The solution becomes viscous at the end of the addition. By cooling down the gelation take place by the interaction of hydrogen bonds with cooling (molar mass of the polymer: 18600 g/mol; molecular weight distribution: 2.2; determined by GPC (polystyrene standard)).

Copolymer of Synthesis Example 3:



25 where n has an average value of 30 and m has an average value of 7, and wherein the polymer can contain various n and m units each of which can have a different number and may be randomly arranged. Note that in other embodiments of this copolymer n may be selected to be in the range of 1-300,
 30 particularly 1-100 and more particularly 1-30; and m may be

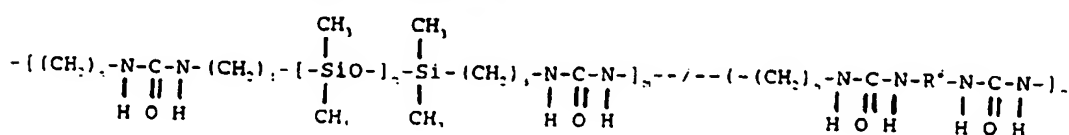
5 selected to be in the range of 1-100, particularly 1-19 and more particularly 1-7.

This synthesis shows that the siloxane polymer can be directly formed in the silicone fluid. This avoids the need to evaporate the solvent in which the siloxane polymer is
10 formed.

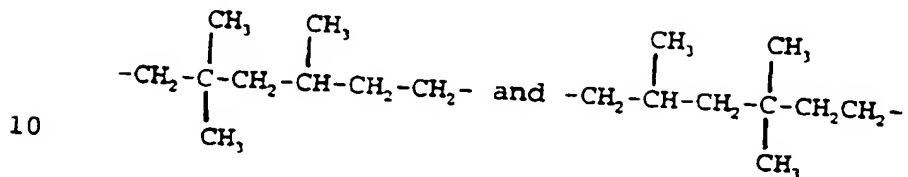
Synthesis Example 4

A main-chain siloxane-urea copolymer is synthesized in THF as solvent. A solution of 0.75 molar part of a liquid
15 telechelic diamino siloxane (molar mass: 2500 g/mol) is added dropwise to a solution of 1 molar part of hexamethylene diisocyanate. A solution of 0.25 molar part of a second diamine, a mixture of 2,2,4-trimethyl 1,6-diamino hexane and 2,4,4-trimethyl 1,6-diamino hexane (molar ratio: 1:1), is
20 added in the same manner. After the polymerization the solvent is removed by evaporation, yielding a clear and colorless polymer (molar mass: 35040 g/mol; molecular weight distribution: 1.5, determined by GPC (polystyrene standard)).

Copolymer of Synthesis Example 4:



5 wherein each occurrence of R⁶ is independently selected from the group consisting of:



wherein m has an average value of 13; n has an average value of 30; and o has an average value of 4; and the portions designated in brackets with m and o can occur as block or random segments in the polymer chain. Note that in other
15 embodiments of this copolymer m may be selected to be in the range of 1-100, particularly 1-20 and more particularly 3-19; n may be selected to be in the range of 1-300, particularly 1-100 and more particularly 30-60; and o may be selected to be
20 in the range of 1-100, particularly 1-20 and more particularly 3-7.

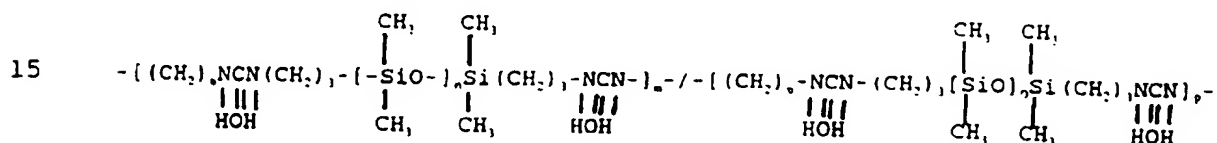
This synthesis example shows use of a plurality of diamine monomers, including the diamine siloxane, in forming the siloxane polymer. The plurality of monomers can modify
25 properties of the gel (for example, provide a gel with higher gel point, provide a less elastic and softer gel, etc.).

Synthesis Example 5

30 A main-chain siloxane-urea copolymer is synthesized in THF as solvent. A solution of 0.66 molar part of a liquid telechelic diamino siloxane (molar mass: 5000 g/mol) is added

5 dropwise to a solution of 1 molar part of hexamethylene diisocyanate. A solution of 0.33 molar part of a second telechelic siloxane diamine (molar mass: 2500 g/mol) is added in the same manner. After the polymerization the solvent is removed by evaporating, yielding a clear and colorless polymer
 10 (molar mass: 88400 g/mol; molecular weight distribution: 1.9; determined by GPC (polystyrene standard)).

Copolymer of Synthesis Example 5:

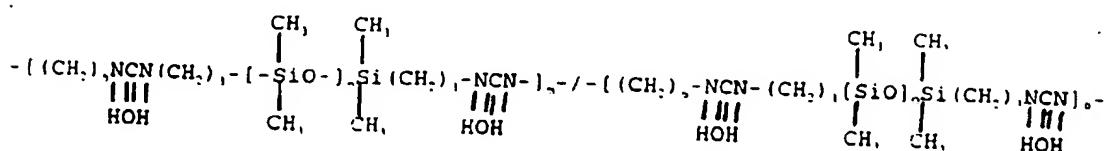


wherein m has an average value of 14; n has an average value of 60; o has an average value of 30; and p has an average value of 7; and the portions designated in brackets with m and
 20 p can occur as block or random segments in the polymer chain. Note that in other embodiments of this copolymer m may be selected to be in the range of 1-100, particularly 1-20 and more particularly 3-19; n may be selected to be in the range
 25 of 1-300, particularly 1-100 and more particularly 30-60; o may be selected to be in the range of 1-300, particularly 1-100 and more particularly 30-60; and p may be selected to be in the range of 1-300, particularly 1-100 and more particularly 30-60.

5' Synthesis Example 6

A main-chain siloxane-urea copolymer synthesized in THF as solvent. A solution of 0.66 molar part of a liquid telechelic diamino siloxane (molar mass: 5000 g/mol) is added dropwise to a solution of 1 molar part of hexamethylene diisocyanate. A solution of 0.33 molar part of a second telechelic siloxane diamine (molar mass: 1000 g/mol) is added in the same manner. After the polymerization the solvent is removed by evaporating. The resulting polymer was dissolved in THF and diethyl amine is added. After the reaction the solvent is removed by evaporating, yielding a clear and colorless polymer (molar mass: 48670 g/mol; molecular weight distribution: 1.7; determined by GPC (polystyrene standard)).

Copolymer of Synthesis Example 6:



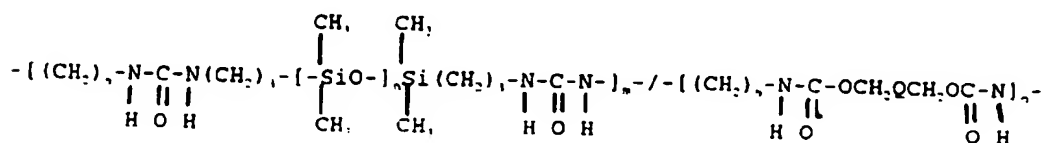
wherein: m has an average value of 9; n has an average value of 30; o has an average value of 10; and p has an average value of 4; and the portions designated in brackets with m and p can occur as block or random segments in the polymer chain, and the ends may be terminated with a group such as (O)=C-N(CH₂CH₃)₂. Note that in other embodiments of this copolymer m may be selected to be in the range of 1-100.

5 particularly 1-20 and more particularly 3-19; n may be selected to be in the range of 1-300, particularly 1-100 and more particularly 30-60; o may be selected to be in the range of 1-300, particularly 1-100 and more particularly 30-60; and p may be selected to be in the range of 1-300, particularly 1-100 and more particularly 30-60.

Synthesis Example 7

A main-chain siloxane-urea-urethane "Copolymer VII" is synthesized in THF as solvent. A solution of 0.25 molar part of 1,4-benzenedimethanol together with dibutyl tin dilaurate is added dropwise to a solution of 1 molar part of hexamethylene diisocyanate. Then the solution is heated up to 67°C for 3 hours. A solution of 0.75 molar part of a liquid telechelic diamino siloxane (molar mass 2500 g/mol) is added in the same manner. After the polymerization, the solvent is removed by evaporation, yielding a clear and colorless polymer. Polymer mass: 48,030 g/mol; molecular weight distribution: 3.0; determined by GPC (polystyrene standard.

Copolymer of Synthesis Example 7 ("Copolymer VII"):



wherein:

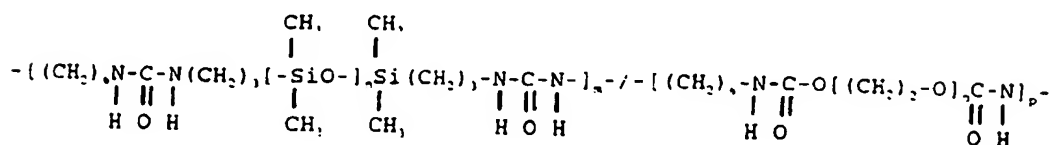
30 Q = phenyl; m has an average value of 17; n has an average

5 value of 30; o has an average value of 6; and the portions
designated in brackets with m and o can occur as block or
random segments in the polymer chain. Note that in other
embodiments of this copolymer m may be selected to be in the
range of 1-100, particularly 1-20 and more particularly 3-19; n
10 may be selected to be in the range of 1-300, particularly 1-
100 and more particularly 30-60; and o may be selected to be
in the range of 1-100, particularly 1-20 and more particularly
3-7.

15 Synthesis Example 8

A main-chain siloxane-urea-urethane "Copolymer VIII" is
synthesized in THF as solvent. A solution of 0.75 molar part
of a liquid telechelic diamino siloxane (molar mass: 2500
g/mol) is added dropwise to a solution of 1 molar part of
20 hexamethylene diisocyanate. A solution of 0.25 molar part of
polyethylene glycol (molar mass: 600 g/mol) together with
dibutyl tin laurate is added in the same manner. Then the
solution is heated up to 67°C for 3 hours. After the
polymerization, the solvent is removed by evaporation,
25 yielding a clear and colorless polymer.

5 Copolymer of Synthesis Example 8 ("Copolymer VIII"):



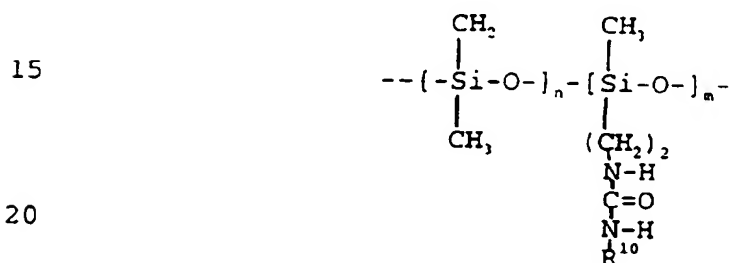
10 wherein:

m has an average value of 10; n has an average value of 30; o has an average value of 25 and p has an average value of 4; and the portions designated in brackets with m and p can occur as block or random segments in the polymer chain. Note that in
 15 other embodiments of this copolymer m may be selected to be in the range of 1-100, particularly 1-20 and more particularly 3-19; n may be selected to be in the range of 1-300, particularly 1-100 and more particularly 30-60; o may be selected to be in the range of 1-1000, particularly 1-100,
 20 more particularly 1-30 and especially 25; and p may be selected to be in the range of 1-100, particularly 1-20 and more particularly 3-7.

Synthesis Example 9

25 A pendant-chain siloxane-urea polymer is synthesized in THF as solvent. A solution of 1 molar part of phenylene isocyanate is added dropwise to a solution of 0.5 molar part amino groups of a liquid siloxane (molar mass: 2900 g/mol, 7 mol % of amino groups.) The liquid siloxane was AMS-162 from
 30 Gelest, Inc. (Tullytown, Pa.), an aminopropyl/methylsiloxane -

5 dimethylsiloxane copolymer with 80-100 cP viscosity. The solution becomes viscous at the end of the addition. The reaction continues for 2 hours at room temperature. After the reaction the solvent is removed by evaporating, yielding a yellow polymer (molar mass: 6600 g/mol; molecular weight distribution: 1.6; determined by GPC (polystyrene standard)).
 10 The polymer produced was a comb-branch urea molecule, of the type depicted in Fig. 4.



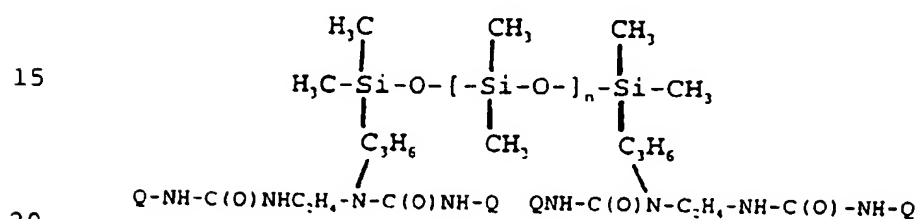
where R^{10} = phenyl and n is selected to give the molecular mass of 6600 g/mol. Note that in other embodiments of this
 25 copolymer m may be selected to be in the range of 1-300, particularly 1-100 and more particularly 30-60; and n may be selected to be in the range of 1-300, particularly 1-100 and more particularly 30-60.

30 Synthesis Example 10

A tetraterminated siloxane-urea polymer is synthesized in dioxane as solvent. A solution of 1.5 molar part of phenylene isocyanate is added dropwise to a solution of 1.0 molar part amino groups of a liquid siloxane (molar mass: 900 g/mol. 4
 35 amino groups per chain). The solution becomes viscous at the

5 end of the addition. After the reaction the solvent is removed by evaporation, yielding a yellow polymer (molar mass: 3900 g/mol; molecular weight distribution: 8.6; determined by GPC (polystyrene standard)).

10 Polymer Synthesis Example 10



where Q = phenyl and each Q is attached to a nitrogen (shown) and n is selected to give a molecular mass of 3900 g/mol.

25 Note that in other embodiments of this copolymer n may be selected to be in the range of 1-300, particularly 1-100 and more particularly 30-60.

Synthesis Example 11:

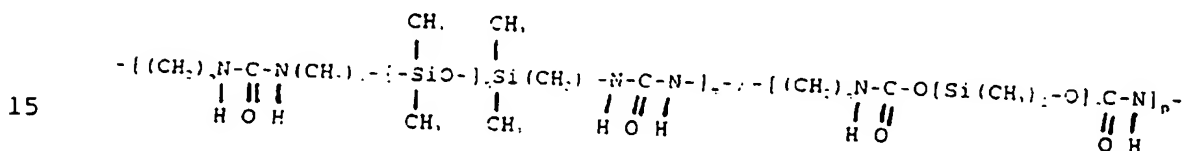
30 A main-chain siloxane-urea-urethane "Copolymer XI" is synthesized in THF as solvent. A solution of 0.5 molar part of a liquid telechelic diamino siloxane (molar mass 2500 g/mol) is added dropwise to a solution of 1.0 molar part of hexamethylene diisocyanate. A solution of 0.5 molar part of a liquid telechelic hydroxy-terminated siloxane (molar mass: 4200 g/mol) together with dibutyl tin dilaurate is added in

35

5 the same manner. Then the solution is heated up to 67°C for 12 hours. After the polymerization, the solvent is removed by evaporation, yielding a clear and colorless polymer. Molar mass: 19,340 g/mol; molecular weight distribution: 1.6; determined by GPC (polystyrene standard).

10

Copolymer of Synthesis Example 11 ("Copolymer XI"):



wherein:

m has an average value of 3; n has an average value of 30; o has an average value of 57 and p has an average value of 3; and the portions designated in brackets with m and p can occur as block or random segments in the polymer chain. Note that in other embodiments of this copolymer m may be selected to be in the range of 1-100, particularly 1-20 and more particularly 1-5; n may be selected to be in the range of 1-300, particularly 1-100 and more particularly 10-60; o may be selected to be in the range of 1-300, particularly 1-100 and more particularly 10-60; and p may be selected to be in the range of 1-100, particularly 1-20 and more particularly 1-5.

In the following examples, as well as throughout the present specification, various names utilized are the CTFA

5 (Cosmetics, Toiletries and Fragrance Association, Inc.) names,
as set for in the CTFA International Cosmetic Ingredient
Dictionary (4th Ed. 1991).

The following Table 3 shows specific silicon-modified
polyamide gellants and amide was co-gellants. Examples 1, 4 and
10 5 are Examples of the current invention. Examples 2 and 3
form amide wax co-gellants and are the subject of a separate
co-pending application.

TABLE 3

Example	Reagent (gm/gm of PA)	Catalyst or Additive Quantity	Extent of Reaction (%)	Siloxane Units per Amide (molar units)
1	$\text{HSi}(\text{CH}_3)_2\text{OSi}(\text{CH}_3)_2$ (0.30 g)	$\text{Ru}(\text{CO})_5$ /5 mg	3.2	0.06
2	$[\text{H}_2\text{N}(\text{CH}_2)_4\text{Si}(\text{CH}_3)_2\text{O}]_n$ (0.5g) ^a	stearic acid	84.7	0.85
3	$[\text{H}_2\text{N}(\text{CH}_2)_4\text{Si}(\text{CH}_3)_2\text{O}]_n$ (0.5g) ^b	acetic acid	91.6	0.92
4	$\text{HSi}(\text{CH}_3)_2\text{OSi}(\text{CH}_3)_2$ (0.88g)	$\text{Ru}(\text{CO})_5$ /15mg	35.1	0.70
5	$[\text{H}_2\text{N}(\text{CH}_2)_4\text{Si}(\text{CH}_3)_2\text{O}]_n$ $\text{Si}(\text{CH}_3)_2\text{O}$ (0.5 g) ^b		4.3	0.17

^a mole % of additive calculated based on the NMR
integration comparison between the $\text{Si}(\text{CH}_3)_2$ group and $-\text{CH}_2$ group
of the PA.

25 ^b mol ratio relative to counter acid.

Table 4 shows formulations of Examples 1-5 from Table 3
in various solutions. In Table 4, C-41 is Ceraphyl 41 and,
30 together with the cyclomethicone, is a solvent for the
formulations shown. One (1) gram of each formulation was
used, except for those in a formulation weight ratio of

5 "(0.5/1.0)", which contained 1.5 grams of the formulation. In these examples, the polyamide (PA) used was Unirez, a product of Union Camp Corp.

TABLE 4

Formulation ^a (includes polyamide or wax of specified Example of Table 3)	C-41 (gm)	Cyclomethicone (gm)	Observation
Ex. 1	5.4	5.4	clear gel
Ex. 1	5.4	6.0	slightly cloudy
Ex. 2	6.0	6.0	almost clear
Ex. 4/PA ^b (0.5/0.5)	5.4	5.0	clear gel
Ex. 4/PA (0.5/0.5)	6.0	6.0	very slightly cloudy
Ex. 2/PA (0.5/0.5)	5.4	6.5	almost clear; hard
Ex. 2/PA (0.5/1.0)	8.5	9.5	almost clear; hard
Ex. 2/PA (0.5/0.5)	4.5	5.3	clear; hard
Ex. 3/PA (0.5/1.0)	5.4	6.0	slightly cloudy after 2 mos.
Ex. 5	5.4	6.0	clear
Ex. 5	5.4	6.5	slightly cloudy

^a Weight ratios

^b PA = "Unirez 2973"

30 Thus, according to the present invention, a solid (for example, gel or stick) composition, having enhanced compatibility with silicone fluids, is provided. The compositions can provide clear cosmetic (for example, antiperspirant and/or deodorant) compositions, utilizing a polyamide gelling agent, while providing a composition having improved application and cosmetic properities, including

5 reduced tackiness and stickiness.

Formulations which could be used to form actual products are shown as follows. A composition of the invention may be substituted for the term "silicon-modified polyamide (gellant)".

10 FORMULATION EXAMPLES

Example 1

The polymer used (denoted Gellant A in the following) is similar to Example 4, above, except that the molar ratio is
15 3/1 instead of 1/1. This copolymer is a polysiloxane-urea copolymer polymerized from hexamethylene diisocyanate and a molar ratio of 3/1 of (1) DMS-A15 (a siloxane diamine with average n~30) and (2) 2,2(4),4-trimethyl 1,6-diamino hexane.

20	Gellant A:	20%
	Cyclomethicone:	69%
	(mixture of Dow Corning 245 and 345 fluids)	
	Isocetyl alcohol:	10%
	Fragrance:	1%

25 This formulation is a clear deodorant stick with good payout.

Example 2

The polymer used (designated Gellant B in the following) is structural Formula (I) set forth previously.

30	Gellant B:	32%
	Cyclomethicone (Dow Corning 345 fluid):	67%
	Fragrance:	1%

This formulation is a clear deodorant gel.

35

5 Example 3

The polymer used (denoted Gellant C in the following) is structural Formula (II) terminated with phenyl urea end groups, set forth previously.

	Gellant C:	
10	Cyclomethicone (Dow Corning 246 fluid):	24.4%
	Isocetyl alcohol:	27.3%
	Sorbitan Oleate (Arlacel 80, a surfactant):	9.8%
	Antiperspirant active (Rezal 36GP):	4.9%
	Distilled water:	19.5%
		14.1%

15 The procedure for forming this formulation follows: the polymer, cyclomethicone and isocetyl alcohol were mixed with heating until a clear, homogeneous liquid solution was produced. The Arlacel 80 and Rezal 36GP were added, with vigorous stirring. Then water was added slowly. This
20 produced a non-tacky, opaque antiperspirant cream.

Example 4

	Product of Synthesis Example 9:	47.7%
25	Cyclomethicone (Dow Corning 245 fluid):	51.3%
	Fragrance:	1%

All components were mixed with heating until a clear solution formed. On cooling, a slightly yellow, clear deodorant gel was produced.

AMIDE EXAMPLES

30 The following examples show formulations suitable for use with amides, but ureas and urethanes of this invention may also be used in such formulations in place of "silicon-modified polyamide (gellant)".

5	1) <u>Deodorant stick</u>		
	silicon-modified polyamide (gellant)	12%	
	C12-15 alkyl lactate (Ceraphyl 41)		
	(emollient)	35%	
	cyclomethicone (silicone fluid)	52%	
10	fragrance (deodorant active)	1%	
	2) <u>Antiperspirant stick</u>		
	silicon-modified polyamide (gellant)	12%	
	aluminum chlorohydrate		
15	(antiperspirant active)	25%	
	cyclomethicone (silicone fluid)	35%	
	C12-15 alkyl lactate		
	(Ceraphyl 41) (emollient)	28%	
20	3) <u>Deodorant gel</u>		
	silicon-modified polyamide (gellant)	6%	
	C12-15 alkyl lactate		
	(Ceraphyl 41) (emollient)	38%	
	cyclomethicone (silicone fluid)	55%	
25	fragrance (deodorant active)	1%	

Thus, according to the present invention, a base composition, which is a thickened composition, thickened to be a gel, soft-solid or stick, and which can contain increased levels of silicone fluids, can be achieved. This composition can also include cosmetically active materials, including antiperspirant and/or deodorant active materials, so as to provide cosmetic compositions, including deodorant and/or antiperspirant compositions for reducing body malodor. Base compositions and cosmetic compositions can be provided as clear and transparent compositions, having good cosmetic properties, particularly in view of the large amounts of silicone fluids that can be incorporated therein. As an

5 antiperspirant composition, the composition has high efficacy,
an attractive appearance and leaves substantially no visible
(white) residue either upon application or after drying of the
composition.

10 While we have shown and described several embodiments in
accordance with the present invention, it is understood that
the same is not limited thereto or the specific embodiments
described herein, but is susceptible to numerous changes and
modifications as known to one having ordinary skill in the
art, and we therefore do not wish to be limited to the details
15 shown and described herein, but intend to cover all such
modification as are encompassed by the scope of the appended
claims.

5 WE CLAIM:

1. A base composition suitable for use in forming a cosmetic composition wherein said base composition comprises:

(a) at least one silicone fluid;

10 (b) at least one gelling agent in a type and amount sufficient to thicken the silicon fluid wherein said gelling agent is selected from the group consisting of polymers which:

(1) contain both siloxane groups and hydrogen-bonding groups to thicken compositions containing volatile
15 and/or non-volatile silicone fluids, wherein (i) each segment of siloxane units in the polymer contains an average of from 1-1000 siloxane units and (ii) the hydrogen bonding groups are selected from the group consisting of ester groups, urethane groups, urea groups, thiourea groups, amide groups and
20 combinations of the foregoing;

(2) are non-flowable at room temperature; and

(3) dissolve in a fluid which contains silicone which fluid is at a temperature of 25 - 250 degrees C to form a translucent or clear solution at a temperature in this range
25 of 25 - 250 degrees C.

2. A composition according to Claim 1 wherein each segment of siloxane units in the polymer contains an average of from 1-300 siloxane units.

30

- 5 3. A composition according to Claim 2 wherein each segment
of siloxane units in the polymer contains an average of from
10-100 siloxane units.
- 10 4. A composition according to Claim 1 wherein the polymers
dissolve in a fluid which contains silicone which fluid is at
a temperature of less than 200 degrees C.
- 15 5. A composition according to Claim 1 further comprising a
cosmetically active ingredient selected from the group
consisting of fragrances, sunscreens, antiperspirants,
deodorants and antibacterials.
- 20 6. A composition according to Claim 1 wherein a clear
solution is formed.
- 25 7. A composition according to Claim 2 wherein a clear
solution is formed.
8. A composition according to Claim 1 wherein the silicone
fluid is selected from the group consisting of:
- (a) linear siloxanes optionally containing aromatic
substitution; and
- (b) cyclic siloxanes having from 4-6 members in a ring
optionally substituted by C1-C6 alkyl or phenyl.
- 30

5 9. A composition according to Claim 6 wherein the siloxane
is selected from the group consisting of phenyl trimethicone
and cyclic dimethyl siloxanes.

10 10. A composition according to Claim 5 wherein the
composition is an antiperspirant composition.

15 11. A composition according to Claim 10 wherein the
antiperspirant is selected from the group comprising aluminum
chlorohydrate, aluminum chloride, aluminum
sesquichlorohydrate, aluminum chlorohydrate PG, aluminum
chlorohydrate PEG, aluminum dichlorohydrate PG, aluminum
dichlorohydrate PEG, zirconyl hydroxychloride, nitradohydrate
and aluminum-zirconium glycine complexes.

20 12. A composition according to Claim 11 wherein the aluminum-
zirconium glycine complex is selected from the group
consisting of aluminum zirconium tetrachlorohydrate gly,
aluminum zirconium trichlorohydrate gly, aluminum zirconium
pentachlorohydrate gly, and aluminum zirconium octochlorohydrate
25 gly.

13. A composition according to Claim 10 wherein the
antiperspirant is included in the composition in a solution
comprising at least one of water and propylene glycol.

30

- 5 14. A composition according to Claim 10 wherein the cosmetic composition is a stick antiperspirant composition.
15. A composition according to Claim 10 wherein the cosmetic composition is a gel antiperspirant composition.
- 10 16. A composition according to Claim 1 wherein the gelling agent is added in an amount of 1-60 percent by weight.
- 15 17. A composition according to Claim 16 wherein the gelling agent is added in an amount of 5-30 percent by weight.
18. A composition according to Claim 17 wherein the gelling agent is added in an amount of 10-20 percent by weight.
- 20 19. A composition according to Claim 1 wherein the silicone fluid is added in an amount of 0.5-95 percent by weight.
20. A composition according to Claim 19 wherein the silicone fluid is added in an amount of 10-80 percent by weight.
- 25 21. A composition according to Claim 20 wherein the silicone fluid is added in an amount of 20-75 percent by weight.
- 30 22. A composition according to Claim 21 wherein the silicone fluid is added in an amount of 30-70 percent by weight.

5 23. A composition according to Claim 1 wherein the gelling agent added does not exceed 50 percent by weight of the base composition.

10 24. A composition according to Claim 2 wherein the gelling agent added does not exceed 50 percent by weight of the base composition.

15 25. A composition according to Claim 1 comprising at least 50 percent by weight of a silicone oil.

20 26. A composition according to Claim 1 further comprising additional solvents selected from the group consisting of solvents which are themselves miscible in the silicon fluid and mixtures of solvents which as a mixture are miscible in the silicone fluid.

25 27. A composition according to Claim 2 further comprising additional solvents selected from the group consisting of solvents which are themselves miscible in the silicon fluid and mixtures of solvents which as a mixture are miscible in the silicon fluid.

30 28. A composition according to Claim 1 further comprising at least one additional ingredient suitable for forming a cosmetic composition, wherein the at least one additional

5 ingredient is added in an amount of 0.5-85 percent by weight based on the weight of the base composition as 100 percent.

29. A composition according to Claim 1 further comprising at least one additional ingredient suitable for forming a
10 cosmetic composition, wherein the at least one additional ingredient is an antiperspirant and is added in an amount of 0.5-85 percent by weight based on the weight of the base composition as 100 percent.

15 30. A composition according to Claim 29 wherein the amount of additional ingredient is 1-75 percent.

31. A composition according to Claim 30 wherein the amount of additional ingredient is 2-55 percent.
20

32. A composition according to Claim 1 wherein the hydrogen bonding group is selected from the groups consisting of urea, urethane and amide.

25 33. A composition according to Claim 1 comprising a multiphase system.

34. A composition according to Claim 29 comprising at least one surfactant.
30

- 5 35. A composition according to Claim 34 comprising at least one surfactant selected from the group consisting of alkanolamides, ethoxylated amides, amine oxides, ethoxylated carboxylic acids, ethoxylated glycerides, glycol esters, monoglycerides, polyglyceryl esters, polyhydric alcohol
10 esters, polyhydric alcohol ethers, sorbitan/sorbitan esters, triesters of phosphoric acid, ethoxylated alcohols, ethoxylated lanolin, ethoxylated polysiloxanes, propoxylated polyoxyethylene ethers and alkylpolyglycosides.
- 15 36. A composition according to Claim 29 comprising a surfactant selected from the group consisting of nonionic surfactants and blends of nonionic surfactants with cationic or anionic surfactants.
- 20 37. A composition according to Claim 29 wherein the surfactant is selected from the group consisting of N-alkyl pyrrolidone, the polyethylene glycol amide of tallow acid that conforms generally to the formula $RC(O)-NH-(CH_2CH_2O)_nH$ where RCO- represents the fatty acids derived from tallow and n has
25 an average value of 50, cocamidopropylamine oxide, the polyethylene glycol diester of lauric acid that conforms generally to the formula
 $CH_3(CH_2)_{10}C(O)-(OCH_2CH_2)_nO-C(O)(CH_2)_{10}CH_3$, a polyethylene glycol derivative of Castor Oil with an average of 4 moles of
30 ethylene oxide, propylene glycol ricinoleate, glycerol

5 myristate, polyglyceryl-4 oleyl ether, sucrose distearate,
 sorbitan sesquiisostearate, trioeth-8 phosphate, laureth-4, a
 polyethylene glycol derivative of Lanolin with an average of
 20 moles of ethylene oxide, dimethicone copolyol, the
 polyoxypropylene, polyoxyethylene ether of cetyl alcohol that
 10 conforms generally to the formula

$\text{CH}_3(\text{CH}_2)_{14}\text{CH}_2(\text{OCH}(\text{CH}_2)\text{CH}_2)_x(\text{OCH}_2\text{CH}_2)_y\text{OH}$ where x has an average
 value of 5 and y has an average value of 20, and lauryl
 glucose.

15 38. A composition according to Claim 29 wherein the
 surfactant is selected from the group consisting of N-alkyl
 pyrrolidone, the polyethylene glycol amide of tallow acid that
 conforms generally to the formula $\text{RC(O)-NH-(CH}_2\text{CH}_2\text{O)}_n\text{H}$ where
 RCO- represents the fatty acids derived from tallow and n has
 20 an average value of 50, cocamidopropylamine oxide, the
 polyethylene glycol diester of lauric acid that conforms
 generally to the formula
 $\text{CH}_3(\text{CH}_2)_{10}\text{C(O)-(OCH}_2\text{CH}_2)_n\text{O-C(O)(CH}_2)_{10}\text{CH}_3$, a polyethylene glycol
 derivative of Castor Oil with an average of 4 moles of
 25 ethylene oxide, propylene glycol ricinoleate, glycerol
 myristate, polyglyceryl-4 oleyl ether, sucrose distearate,
 sorbitan sesquiisostearate, trioeth-8 phosphate, laureth-4, a
 polyethylene glycol derivative of Lanolin with an average of
 20 moles of ethylene oxide, dimethicone copolyol, the
 30 polyoxypropylene, polyoxyethylene ether of cetyl alcohol that

5 conforms generally to the formula

$\text{CH}_2(\text{CH}_2)_{14}\text{CH}_2(\text{OCH}(\text{CH}_2)\text{CH}_2)_x(\text{OCH}_2\text{CH}_2)_y\text{OH}$ where x has an average value of 5 and y has an average value of 20, and lauryl glucose.

10 39. A composition according to Claim 29 wherein the surfactant is present in an amount of 0-15 percent by weight.

40. A composition according to Claim 29 wherein the surfactant is present in an amount of 0-4 percent by weight.

15

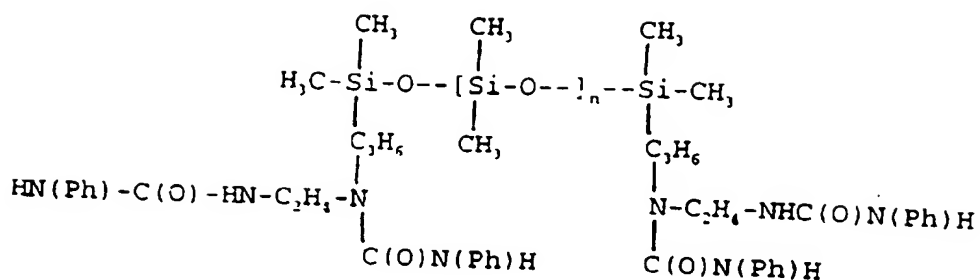
41. A composition according to Claim 1 in which the cosmetic composition formed with the base composition is selected from the group consisting of a cream, gel and stick.

20 42. A composition according to Claim 1 wherein the polymer is selected from the group consisting of siloxane/urea copolymers which are linear and which contain urea groups as hydrogen-bonding groups in the backbone of the polymer.

25 43. A composition according to Claim 1 wherein the polymer is a polysiloxane terminated with four urea groups represented by Formula I:

30

5



10

where Ph = phenyl and n is an average number for the number of dimethyl siloxane units and n is an average number and is selected from 0-300.

15

44. The composition according to Claim 43 wherein n represents an average value and is a number from 0-100.

45. The composition according to Claim 44 wherein n is 50.

20

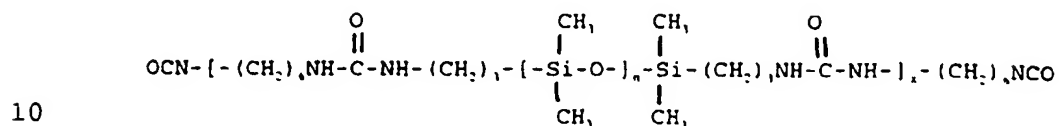
46. A composition according to Claim 1 wherein said gelling agent is endcapped.

25

47. A composition according to Claim 46 wherein said end capping is effected with the use of an agent selected from the group consisting of C1-C20 aliphatic monohydric alcohols, C1-C6 aliphatic amines, phenyl amine optionally substituted by 1-3 members selected from C1-C6 aliphatics, C1-C20 aliphatic acids and C1-C20 aliphatic acid chlorides.

30

- 5 48. A composition according to Claim 1 wherein the polymer is an end-capped siloxane/urea copolymer of Formula II:



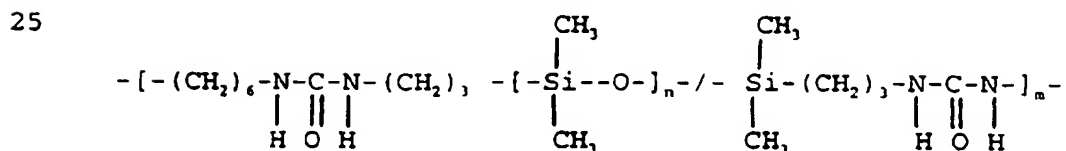
where x is an average and is a number in the range of 1-100.

- 15 49. A composition according to Claim 48 wherein x = 2-40.

50. A composition according to Claim 47 wherein said end capping is effected with aniline.

- 20 51. A composition according to Claim 46 wherein end capping is effected by hydrolysis to form an amine end group.

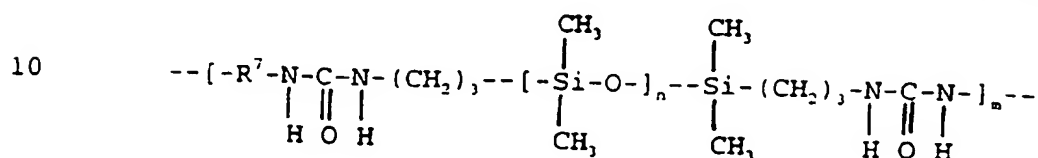
52. A composition according to Claim 1 wherein the polymer is a main-chain siloxane-urea copolymer of the following formula:



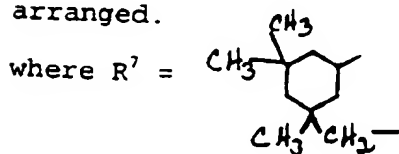
- 30 where n has an average value of 1-30 and m has an average value of 1-12, and wherein the polymer can contain various n and m units each of which can have a different number and may

5 be randomly arranged.

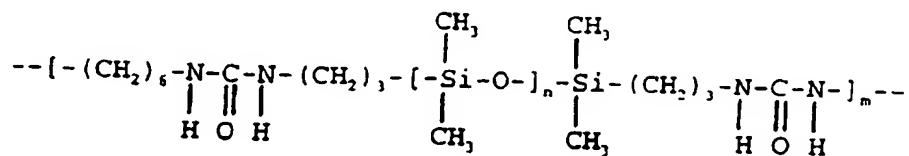
53. A composition according to Claim 1 wherein the polymer is a main-chain siloxane-urea copolymer of the following formula:



where n has an average value in the range 1-300, 1-100 or 1-30 and m has an average value in the range of 1-100 or 1-19, and wherein the polymer can contain various n and m units each of which can have a different number and may be randomly arranged.

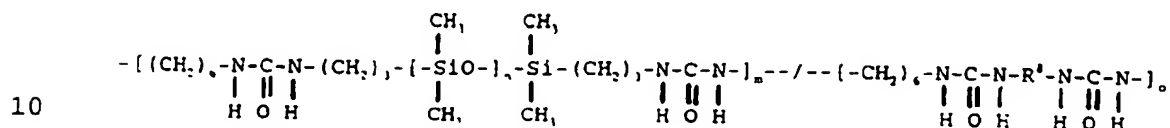


20 54. A composition according to Claim 1 wherein the polymer is a main-chain siloxane-urea copolymer of the following formula:

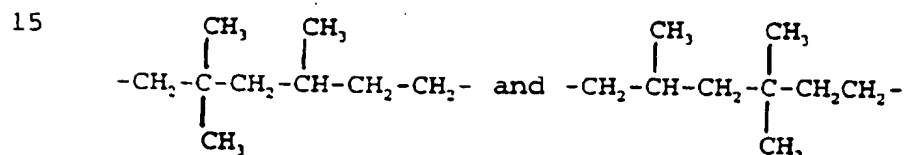


where n has an average value in the range of 1-300, 1-100 or 1-30 and m has an average value in the range of 1-100, 1-19 or 1-7, and wherein the polymer can contain various n and m units each of which can have a different number and may be randomly arranged.

- 5 55. A composition according to Claim 1 wherein the polymer is a main-chain siloxane-urea copolymer of the following formula:



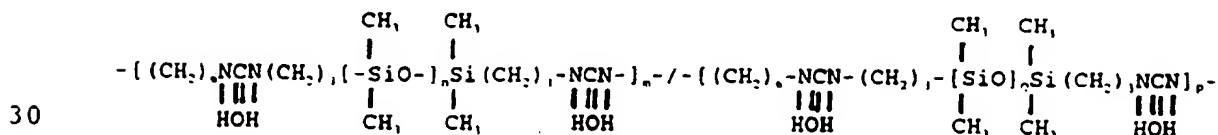
wherein each occurrence of R^8 is independently selected from



- 20 where m has an average value of 1-100, 1-20 or 3-19; n has an average value of 1-300, 1-100 or 30-60; o has an average value of 1-100, 1-20 or 3-7; and the portions designated in brackets with m and o can occur as block or random segments in the polymer chain.

25

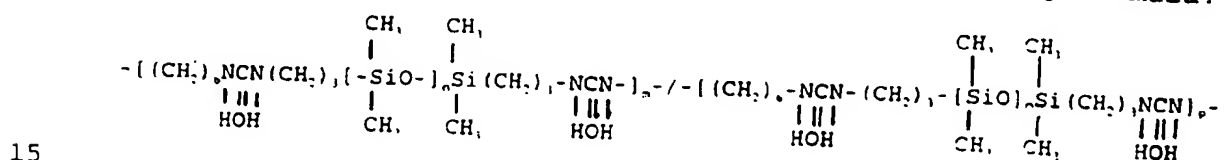
56. A composition according to Claim 1 wherein the polymer is a main-chain siloxane-urea copolymer of the following formula:



where n has an average value of 1-300, 1-100 or 30-60; m has an average value of 1-100, 1-20 or 3-19; o has an average

5 value of 1-300, 1-100 or 30-60; p has an average value of 1-300, 1-100 or 30-60; and the portions designated in brackets with m and p can occur as block or random segments in the polymer chain.

10 57. A composition according to Claim 1 wherein the polymer is a main-chain siloxane-urea copolymer of the following formula:

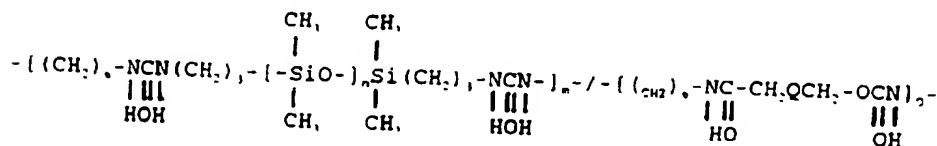


where n has an average value of 1-300, 1-100 or 30-60; m has an average value of 1-100, 1-20 or 3-19; o has an average value of 1-300, 1-100 or 30-60; p has an average value of 1-300, 1-100 or 30-60; the portions designated in brackets with m and p can occur as block or random segments in the polymer chain; and the ends may be terminated with (O)=C-N(CH₂CH₃)₂.

20

58. A composition according to Claim 1 wherein the polymer is a main-chain siloxane-urea-urethane copolymer of the following formula:

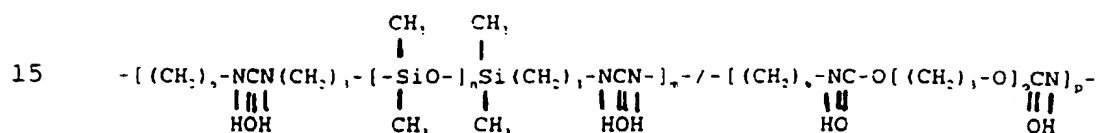
25



30 where Q = phenyl, m has an average value in the range of 1-100, 1-20 or 3-19; n has an average value in the range of 1-

5 300, 1-100 or 30-60; o has an average value in the range of 1-100, 1-20 or 3-7; and the portions designated in brackets with m and o can occur as block or random segments in the polymer chain.

10 59. A composition according to Claim 1 wherein the polymer is a main-chain siloxane-urea-urethane copolymer of the following formula:

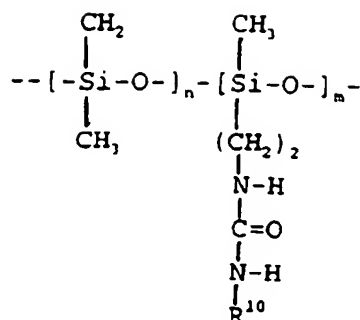


where n has an average value of 1-300, 1-100 or 30-60; m has an average value of 1-100, 1-20 or 3-19; o has an average value of 1-1000, 1-100, 1-30 or 25; p has an average value of 1-100, 1-20 or 3-7; and the portions designated in brackets with m and p can occur as block or random segments in the polymer chain.

25 60. A composition according to Claim 1 wherein the polymer is a comb-branch pendant-chain siloxane-urea polymer having segments of the following formula:

30

5



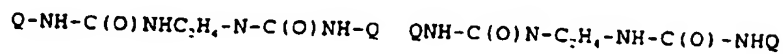
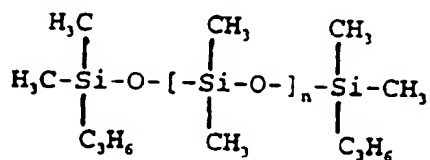
10

where R^{10} = phenyl; n has an average value of 1-300, 1-100 or 30-60 and m has an average value of 1-300, 1-100 or 30-60.

15

61. A composition according to Claim 1 wherein the polymer is a tetra-terminated siloxane-urea polymer having segments of the following formula:

20

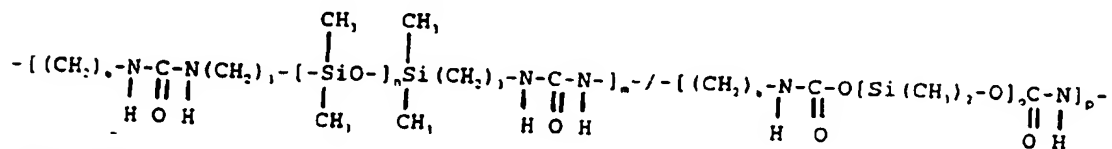


where Q = phenyl and n has an average value of 1-300, 1-100 or 30-60.

25

62. A composition according to Claim 1 wherein the polymer has the following formula

30



wherein:

m has an average value in the range of 1-100, 1-20 or 1-5; n

5 has an average value in the range of 1-300, 1-100 or 10-60; o
has an average value in the range of 1-300, 1-100 or 10-60;
and p has an average value in the range of 1-100, 1-20 or 1-5,
and the portions designated in brackets with m and p can occur
as block or random segments in the polymer chain.

10

63. A composition according to Claim 1 wherein the gelling
agent is a polyamide.

15

64. A composition according to Claim 1 wherein the gelling
agent comprises siloxane copolymers in which a siloxane
diamine is reacted with a diacid, diacid derivative,
diisocyanate or diisothiocyanate.

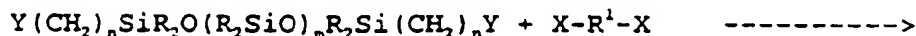
20

65. A composition according to Claim 62 in which the siloxane
polymers are formed by reacting a member of the group
consisting of siloxane diacids and siloxane acid derivatives
with a member of the group consisting of diols and diamines.

25

66. A composition according to Claim 1 wherein the gelling
agent comprises siloxane copolymers produced by Reaction
Scheme III:

REACTION SCHEME III



30



5 where:

R at each occurrence is independently selected from the group consisting of methyl, ethyl, propyl, isopropyl and phenyl wherein the phenyl may optionally be substituted by 1-3 of a member of the group consisting of methyl and ethyl;

10 R¹ is an alkyl chain selected from the group consisting of 1-40 carbons, 2-20 carbons and 2-6 carbons and optionally substituted by a member selected from the group consisting of C1-C4 alkyl, phenyl, hydroxyl, carboxyl and amino and optionally containing at least one alkenyl or aromatic group
15 in the main chain or in a pendent group; and
X = NH₂ when Y = CO₂H and X = CO₂H when Y = NH₂.

67. A composition according to Claim 62 wherein a polymer comprising a polyamide without silicon moieties is modified by
20 grafting the polyamide with pendant oligosiloxane groups using a method selected from the group consisting of:

(a) hydrosilation of unsaturated bonds in non-hydrogenated dimer-based polyamides;

(b) silylation of the amide groups in polyamides; and

25 (c) silylation of unsaturated polyamides by oxidation.

68. A composition according to Claim 1 wherein the silicone fluid is cyclomethicone.

30

5 69. A composition according to Claim 2 wherein the silicone fluid is cyclomethicone.

70. A base composition suitable for use in forming a cosmetic composition wherein said base composition is made by combining
10 in any order:

(a) at least one silicone fluid;

(b) at least one gelling agent in a type and amount sufficient to thicken the silicon fluid wherein said gelling agent is selected from the group consisting of polymers which:
15 (1) contain both siloxane groups and hydrogen-bonding groups to thicken compositions containing volatile and/or non-volatile silicone fluids, wherein (I) each segment of siloxane units in the polymer contains an average number of siloxane units n wherein n is selected from one of the ranges 1-1000,
20 1-300 and 10-100; and (ii) the hydrogen bonding groups are selected from the group consisting of ester groups, urethane groups, urea groups, thiourea groups, amide groups and combinations of the foregoing;

(2) are non-flowable at room temperature; and
25 (3) dissolve in a fluid which contains silicone which fluid is at a temperature of 25 - 250 degrees C to form a translucent or clear solution at a temperature in this range of 25 - 250 degrees C.

- 5 71. A composition according to Claim 1 wherein the composition includes the addition of a cosmetically active ingredient selected from the group consisting of fragrances, sunscreens, antiperspirants, deodorants and antibacterials.
- 10 72. A cosmetic composition for reducing malodor of person which composition is made according to Claim 5.
73. A cosmetic composition for reducing malodor of person which composition is made according to Claim 6.
- 15 74. A cosmetic composition for reducing malodor of person which composition is made according to Claim 27.
75. A cosmetic composition for reducing malodor of person which composition is made according to Claim 29.
- 20 76. A cosmetic composition for reducing malodor of person which composition is made according to Claim 70.
77. A method of reducing malodor of a person, comprising the step of applying the cosmetic composition of Claim 72 to axillary regions of the person.
- 25 78. A method of reducing malodor of a person, comprising the step of applying the cosmetic composition of Claim 73 to
- 30

5 axillary regions of the person.

79. A method of reducing malodor of a person, comprising the step of applying the cosmetic composition of Claim 74 to axillary regions of the person.

10

80. A method of reducing malodor of a person, comprising the step of applying the cosmetic composition of Claim 75 to axillary regions of the person.

15 81. A method of reducing malodor of a person, comprising the step of applying the cosmetic composition of Claim 76 to axillary regions of the person.

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FIG. 1

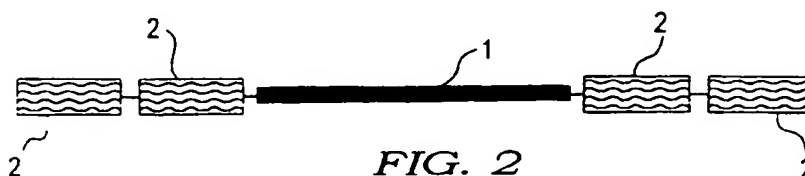


FIG. 2

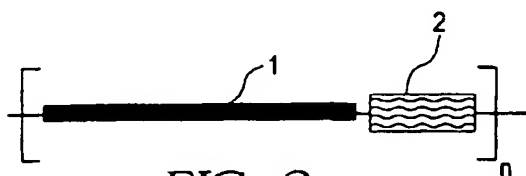


FIG. 3

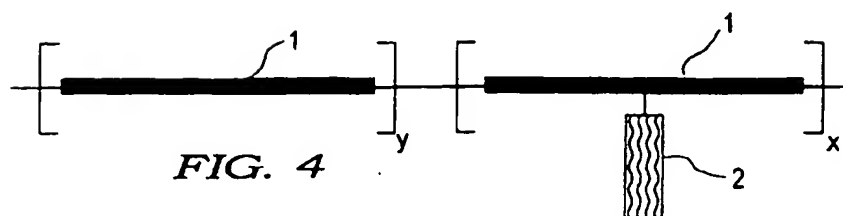
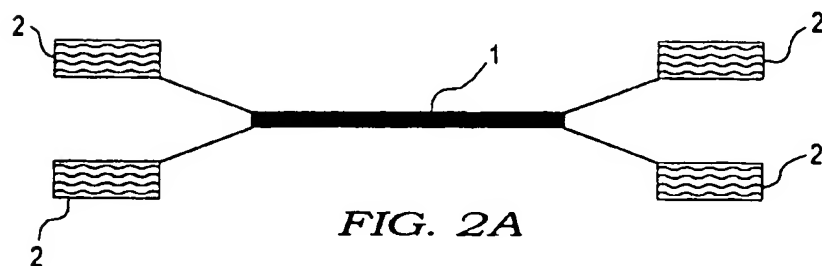
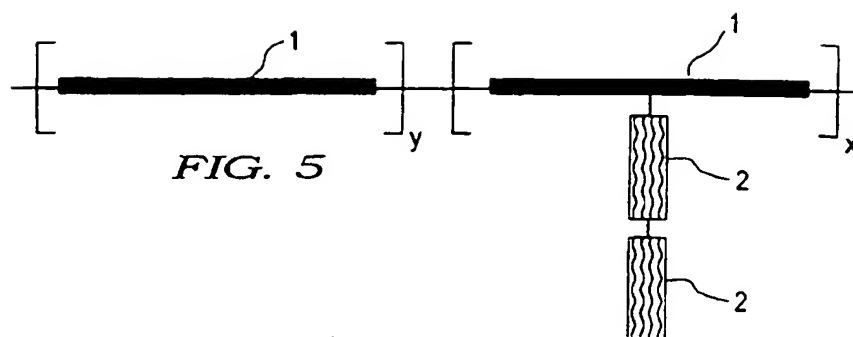


FIG. 4

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INTERNATIONAL SEARCH REPORT

International Application No.

PCT/US 97/05310

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A61K7/48 A61K7/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	EP 0 738 511 A (RHONE-POULENC CHIMIE) 23 October 1996 see claims see page 5, line 11 - line 27 ---	1,5,11, 13-16, 71,73
P,A	GB 2 299 024 A (UNILEVER PLC) 25 September 1996 see claims see page 2, line 1 - page 4, line 32 ---	1,2,5,8, 10,11,14
A	US 5 500 209 A (L. ROSS ET AL) 19 March 1996 cited in the application see column 13, line 35 - column 15, line 55 --- -/--	1,5,6, 10-21,71

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

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- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
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X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search

14 August 1997

Date of mailing of the international search report

27.08.97

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl.
Fax (+31-70) 340-3016

Authorized officer

McConnell, C

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/US 97/05310

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US 4 806 338 A (SMITH SCOTT E) 21 February 1989 see column 3, line 40 - column 4, line 29 -----</p>	1

INTERNATIONAL SEARCH REPORT

information on patent family members

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